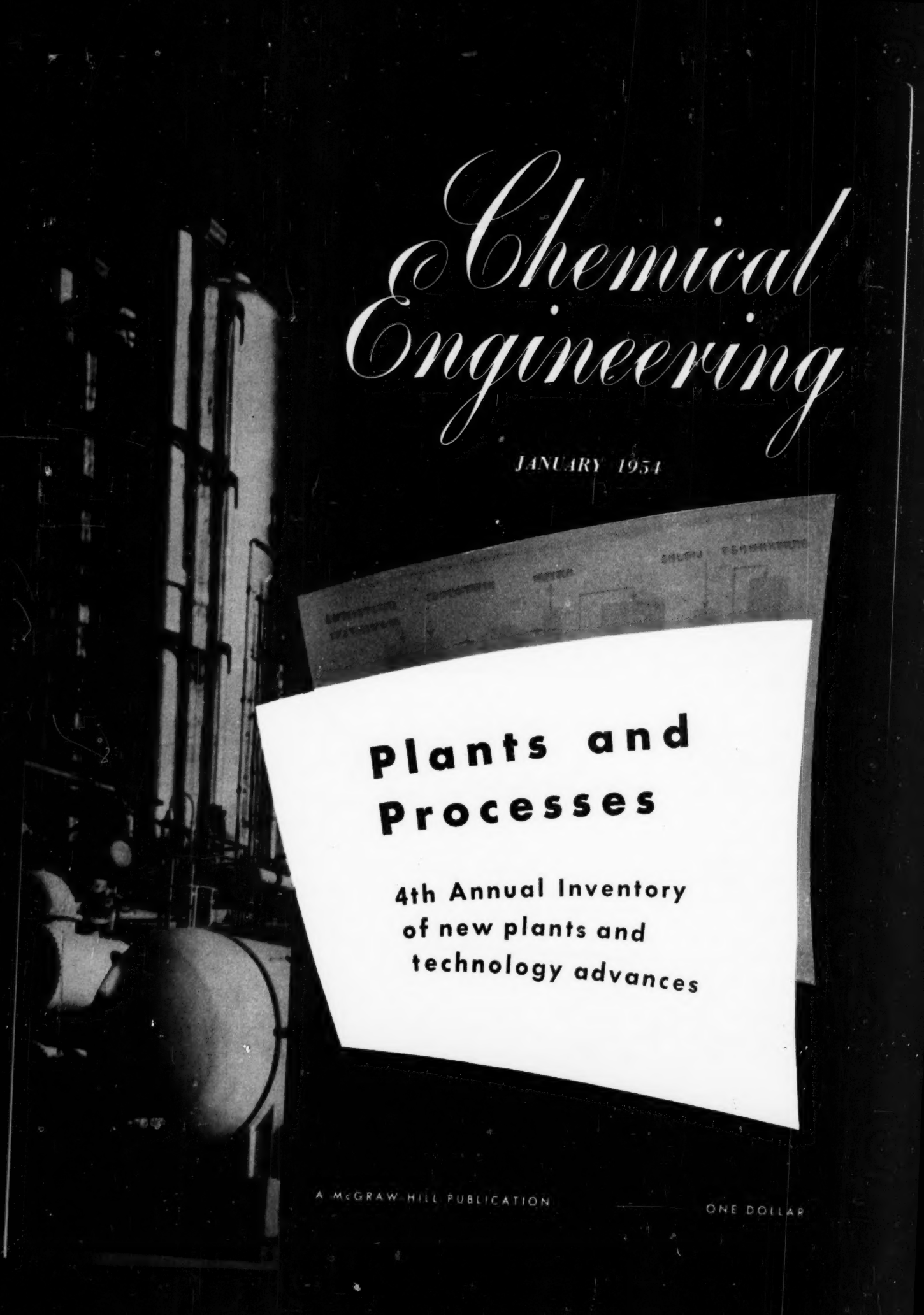


Chemical Engineering

JANUARY 1954

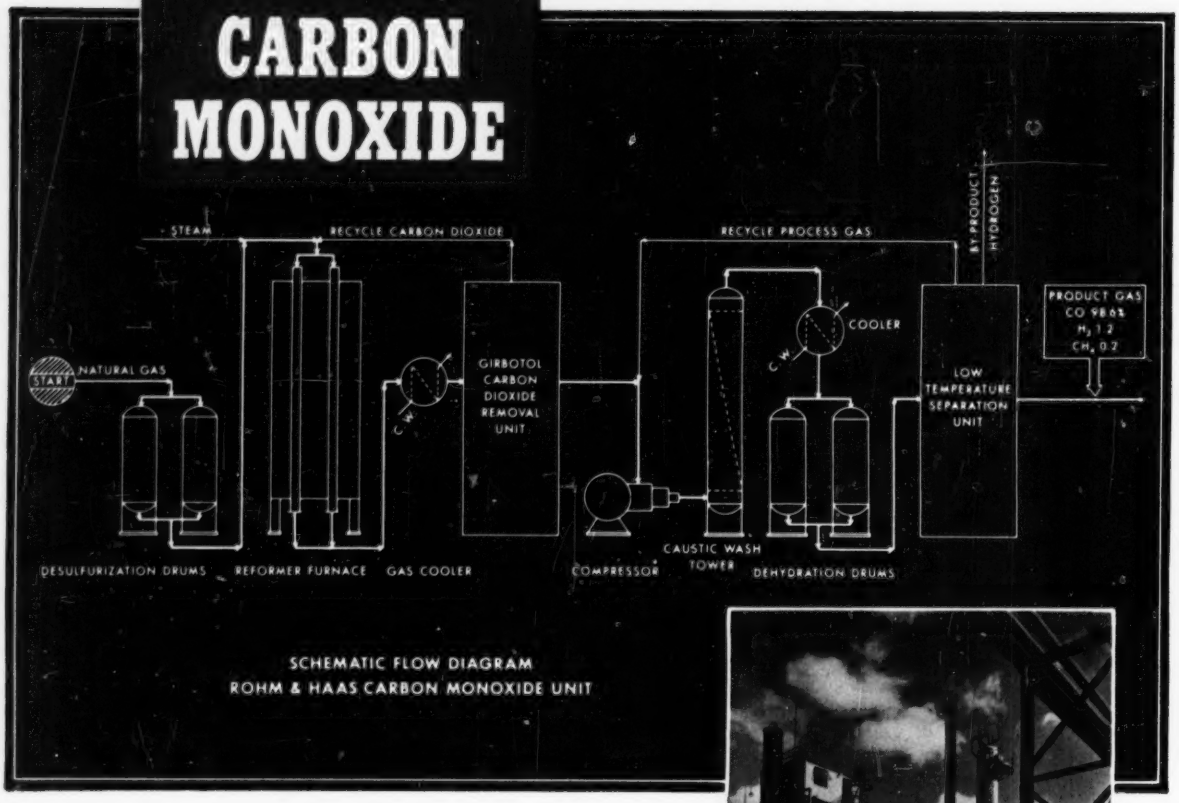
Plants and Processes

4th Annual Inventory of new plants and technology advances

A McGRAW-HILL PUBLICATION

ONE DOLLAR

CARBON MONOXIDE



SCHEMATIC FLOW DIAGRAM
ROHM & HAAS CARBON MONOXIDE UNIT

GIRDLER PLANT helps

Rohm & Haas reduce acrylics price 12%

THIS GIRDLER PLANT produces carbon monoxide of 98% purity by the process shown in the above schematic flow chart. It is part of the new Rohm & Haas plant at Houston, Texas, which has resulted in a price reduction of 12% for ethyl acrylate monomer . . . from 48¢ to 42¢ per pound.

Operation of the Girdler plant is continuous, practically automatic and instrument-controlled. Output can be varied readily to meet production demands.

Girdler is qualified to handle all phases of process plant projects such as this. By coordinating design, engineering and construction, sound results and speedy progress are assured. For further information, call the nearest Girdler office today.

GIRDLER DESIGNS processes and plants
GIRDLER BUILDS processing plants
GIRDLER MANUFACTURES processing apparatus

GAS PROCESSES DIVISION:

Chemical Processing Plants
Hydrogen Production Plants
Hydrogen Cyanide Plants
Synthesis Gas Plants
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Plastics Materials Plants
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the GIRDLER Company

A DIVISION OF NATIONAL CYLINDER GAS COMPANY
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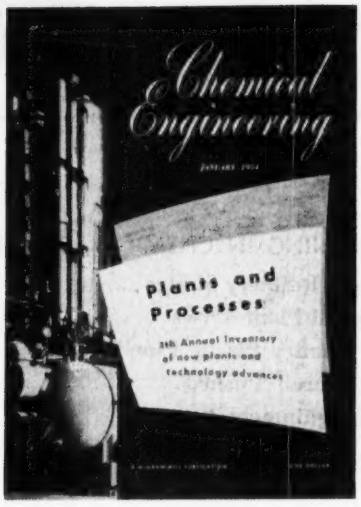
GUIDED TOUR

JOHN R. CALLAHAM, EDITOR



. . . Chalk up for 1953: 675 new plant projects, 325 technology advances.

That's what we've come up with after taking a long, hard look at last year's most newsworthy developments in plant construction, processes and technology in the chemical process industries.

You'll find the significant details on who, what and where—all tabulated for your quick and easy reference—in this issue's special 40-page report. It's CE's exclusive fourth annual inventory of new Plants & Processes. (*Feature Report*)

How—and why—solids agglomerate.

Here's a practical, hard-headed analysis that'll help you do a better job of "making big ones from little ones." Carl Ludwig sheds new light on an old but tricky unit operation. (*Article*)

What utilities for vacuum jets?

No more guessing now! For USI engineers bring you 104 complete sets of con-

Please turn page

You'll Be Glad to Hear . . .

Yes, you'll be glad to hear that we're making several changes, all starting with this issue. They'll make CE better and more useful for all our 38,700 subscribers.

Most basic change is a brand new arrangement of editorial departments and ads. Net effect: Less mixing of ads and editorial on the same page. We describe this innovation—and what it means to you—on p. 149.

Our next change (one that's difficult to describe) has to do with the arrangement of feature articles. Net effect: You'll be able to clip and save more articles without destroying parts of adjacent articles. This makes more features—as well as all departments—fileable as complete, intact units.

Finally, we've improved Reader Service, particularly the Technical Literature section (p. 476). This popular department now offers you better, faster, more complete service than ever before.

There'll be more changes this year, too.—JRC

GUIDED TOUR

sumption data on steam and water needs. They're tabulated and graphed for your convenient use. (*Article*)

Fluidized crystal dryer pays off.

Process engineer Jobes tells how it slashes fuel costs two thirds, dries at a lower temperature, cuts down crystal degradation, eliminates a cooler. (*Article*)

What's new on the equipment front.

A column-type liquid-liquid extractor; improved crystal-dewatering centrifugal; beta rays for hydrocarbon analysis; dome to cut vapor losses. (*Equipment*)

How to get and hold a good man.

Lid's off one of the hottest personnel studies in years. Some 1,400 engineers square off to spill what they like—and don't like—about their jobs; 200 executives mince no words to tell their story. Here're the details. (*You & Your Job*)

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Chemical Engineering

JANUARY 1954

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January 1954 Vol. 61—No. 1

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ARE CONSIDERED

It's Automatically the Finest!

IN . . .
ENGINEERING
DESIGN
CONSTRUCTION

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175 POST ROAD, (WARWICK) PROVIDENCE 5, R. I., U.S.A.
SALES OFFICES IN ALL PRINCIPAL CITIES
MANUFACTURING PLANTS IN WARWICK, R. I., U.S.A., CANADA, ENGLAND, FRANCE AND HOLLAND

TRIETHANOLAMINE
from Carbide and Carbon

25 *...for more than a quarter of a century*

That's how long CARBIDE has been producing and supplying triethanolamine. Of all the amines produced, this viscous, hygroscopic liquid offers one of the widest ranges of uses for emulsions and other chemical processing fields. So, before you decide on any amine, consider CARBIDE's triethanolamine —available in two grades, "regular" and "98 per cent."

SOME OF THE TYPICAL USES OF TRIETHANOLAMINE:

Industrial Oil Emulsions
- increasing solubility of sulfonated oils
- wool lubrication
- leather fat-liquoring
- other oil emulsions

Soluble Oils
- soluble mineral oils
- cutting oils
- textile machinery lubricants
- rayon oils
- orchard sprays

Solvent Emulsions
- hydrocarbon solvent emulsions
- chlorinated solvent emulsions

Industrial Wax Emulsions
- dispersion of casein, shellac, dyes, and rubber latex
- shoe polishes and leather dressings
- sizing and water-proof coatings

Oil and Wax Polishes

Rubless Floor Polishes

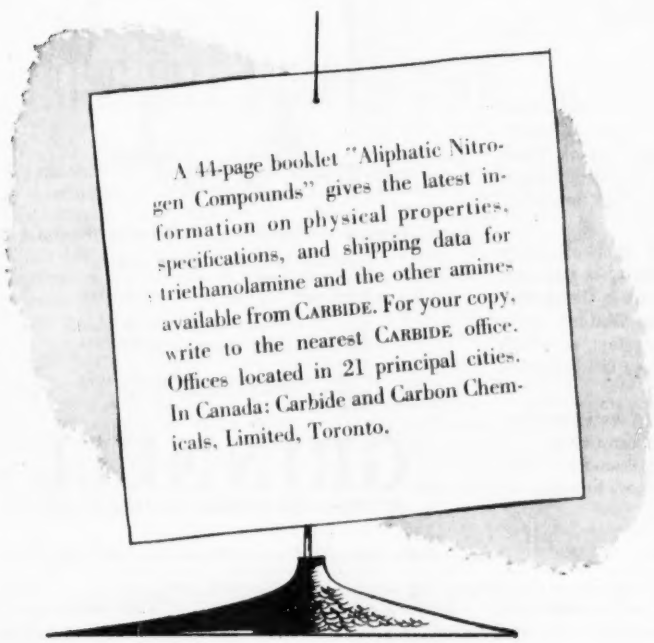
Cosmetic Preparations and Detergents

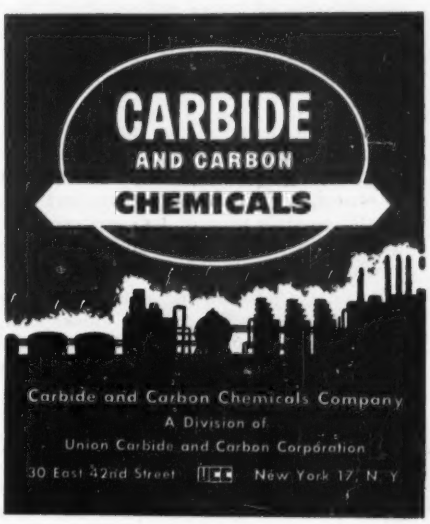
Neutralize Natural Oils, Clays and Pigments

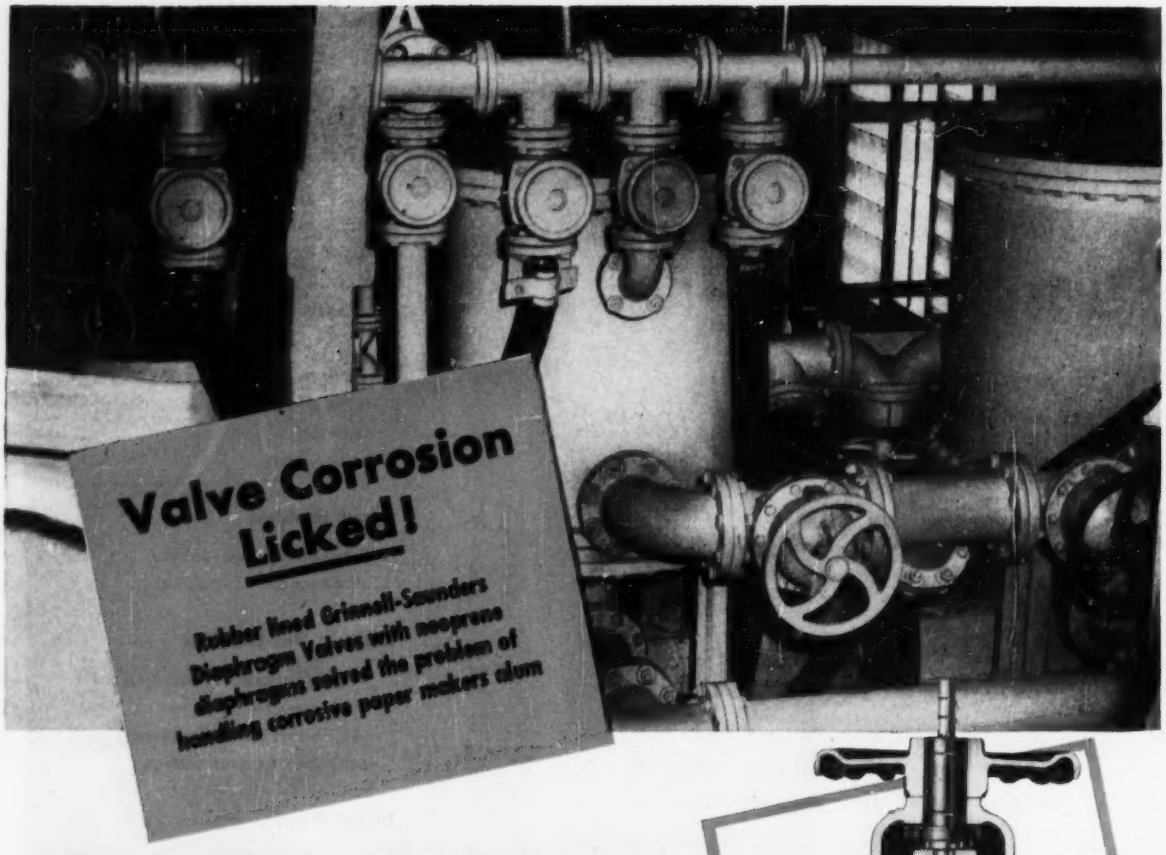
Photographic Film Developing Baths

Removal of Carbon and Gum Deposits

Corrosion Inhibitor


A 44-page booklet "Aliphatic Nitrogen Compounds" gives the latest information on physical properties, specifications, and shipping data for triethanolamine and the other amines available from CARBIDE. For your copy, write to the nearest CARBIDE office. Offices located in 21 principal cities. In Canada: Carbide and Carbon Chemicals, Limited, Toronto.




Valve Corrosion Licked!
Rubber lined Grinnell-Saunders Diaphragm Valves with neoprene diaphragms solved the problem of handling corrosive paper makers alum

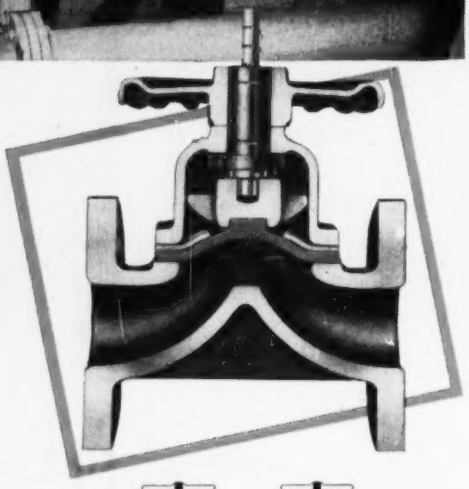
GRINNELL-SAUNDERS DIAPHRAGM VALVES

Commercial aluminum sulphate *can be everlastingly troublesome,* as anyone knows who has ever had to work with it. So, comparing notes with a company that handles this chemical every day of its business life may be helpful.

Northern Chemical Industries, Searsport, Me., is an important manufacturer of "paper makers alum". Northern Chemical Industries relies heavily on Grinnell-Saunders Diaphragm Valves. They have found that the wide range of body, lining and diaphragm materials available with Grinnell-Saunders valves offers flexibility in handling a wide variety of corrosive fluids.

The basic design of the valve is an advantage. Working parts are completely isolated from the fluid stream which, in the case of corrosive acids, means longer valve life. Also, there is the matter of economy. With Grinnell-Saunders Diaphragm Valves, it is usually possible to go to less expensive body materials, to which special body linings can be added. Replacement and maintenance expenses, moreover, are greatly reduced.

Originally designed and ideally suited for air and water service, Grinnell-Saunders Diaphragm Valves also are recommended for almost every regular or special service. This is backed up by the excellent performance records achieved by valves now in use.



Features of Grinnell-Saunders Diaphragm Valve:

- Diaphragm absolutely isolates working parts from fluid
- Diaphragm lifts high for streamline flow in either direction
- Diaphragm presses tight for positive closure
- Body, lining and diaphragm materials to suit service
- Simple maintenance — diaphragm easily replaced without removing valve from line

GRINNELL
WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

Another new development using

B. F. Goodrich Chemical *raw materials*

B. F. Goodrich Chemical Co. supplies only the Geon polyvinyl chloride compound for the drain rail.

KING-SIZE MOLDED VINYL "RUN-OFF" improves freezer unit efficiency

PICTURED here is another new use for Geon polyvinyl resin—one that shows how readily adaptable Geon is to unusual requirements.

It's a flexible drain rail for conveying defrosted water from a freezer unit —one of the largest, injected molded vinyl parts ever made. It not only provides a trouble-free means of carrying off defrosted water to the drain pan, but has many extra advantages.

Because it is made of Geon polyvinyl plastic, it is kept clean easily with a wipe of a damp cloth; household cleaning detergents, solvents, oil and grease do not affect it. Also because of Geon, it withstands wide temperature changes without becoming hard and brittle—imparts no odors to stored food.

The unusually large size of this drain rail illustrates the many possibilities for injection molding with Geon vinyl compounds. It measures 4½ feet from tip to tip and nearly 2 inches in width, weighs 21½ ounces. Installation in the refrigerator is a simple operation.

You may get an idea from this of how a Geon material can help you improve or develop more saleable products. Geon materials can make products flexible *or* rigid, transparent or opaque. They have helped solve many problems—and build sales for such products as tablecloths, curtains, flooring, wire insulation, gaskets and many more products for home and industry. We'll help you select the Geon material best suited to your needs. For information, please write Department GE-1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

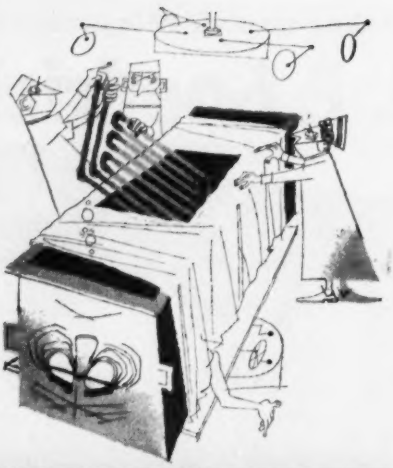
GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable

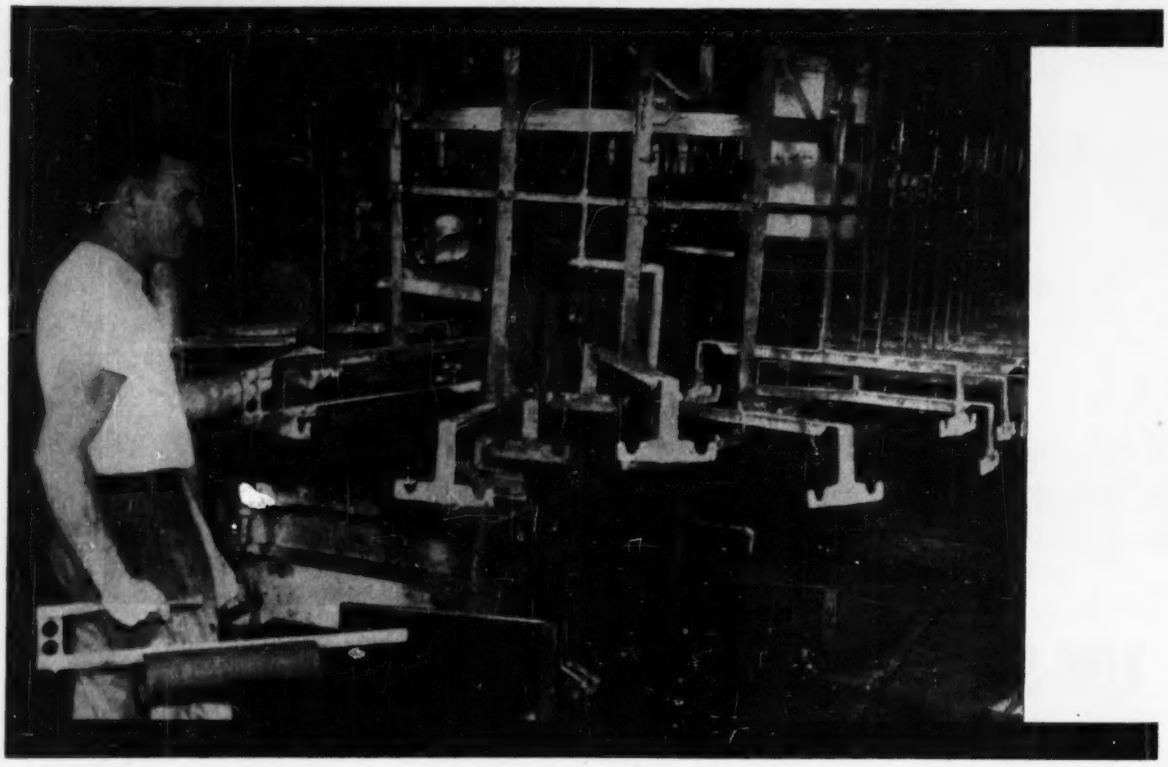
GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors

coil-itis* cured — chipping eliminated by PLATECOILS to save 6 to 8 hours daily

Use of Stainless Steel Platecoils in a phosphate coating tank at Sealed Power Corporation has completely eliminated a 6 to 8 hour a day chipping job. The brass pipe coils formerly used became so coated with scale they had to be cleaned daily.

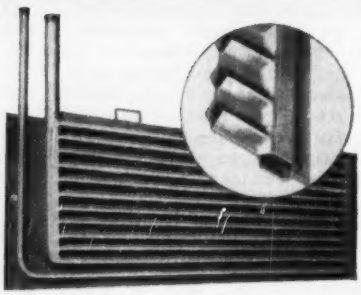
Three Platecoils heat this tank as efficiently as four pipe coils and maintain desired temperatures throughout both shifts. Scale removal, when necessary, takes less than two manhours compared to 10 hours for pipe coils.



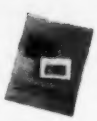


PLATECOILS® replace pipe coils for 50% of the cost

* Coil-itis is the constant doctoring of wet processing tanks for pipe coil troubles. It can be cured easily by replacing pipe coils with Platecoils. Immediately, you will notice the difference at Platecoils put new life and profits into your heat transfer processes. They heat or cool 50% faster and take 50% less space in the tank. They save as much as 50% in initial cost and 50% in maintenance costs in addition to overcoming the limitations and operating difficulties of old fashioned and outmoded pipe coils.



Bulletin P61 shows how Platecoils are replacing pipe coils at a savings throughout industry. Send today for your copy.



Platecoil Division, TRANTER MANUFACTURING, inc., Lansing 4, Michigan

WHICH Apply To *Your* Filtering?

Check 'em off one by one and you may get an idea of what BIRD CENTRIFUGAL FILTERS can do to help you produce a better product and more of it per day at lower cost per ton.

HOT: BIRDS are handling oil from coal hydrogenation at 300°F. They are handling brines at boiling temperature. No "flashing" problems such as you encounter with vacuum filtration.

COLD: An aromatic hydrocarbon is filtered by the BIRD at a temperature of *minus* 100°F., without encountering insulation problems.

COARSE FEEDS: Coal up to ⅜", potash and sodium chloride bearing ores up to ¼" are handled continuously in big volume by BIRDS, with maintenance a few pennies a ton.

FINE FEEDS: Nothing like the BIRD for handling precipitated chrome yellows, barium sulphate and the like, where all particles are minus one-half micron.

BIG TONNAGE: Ton a minute dewatering of fine coal is standard practice with BIRDS. The same goes for many ores and mineral products.

SMALL TONNAGE: A few hundred pounds an hour is accepted practical and highly efficient and economical when BIRDS are handling fine pigments and chemicals.

THICK SLURRIES: Cement slurries at ball mill consistencies are readily and efficiently handled by the BIRD.

THIN SLURRIES: Flocculated materials containing less than five percent suspended solids by weight are put through BIRDS, eliminating bulky, costly thickening equipment.

HEAVY SOLIDS: Take barytes with a specific gravity of 4.3 and some metallic ores that are even heavier. They hold no terrors for the BIRD.

LIGHT SOLIDS: Take synthetic resins with a specific gravity of only 1.1 — BIRDS are virtually standard in this industry.

CHEAP MATERIALS: Like coal, cement, fertilizers — a few dollars a ton. The BIRD handles them at lower cost.

COSTLY MATERIALS: Pharmaceutical and fine chemicals selling for dollars a pound owe much of their quality and purity to intermediate processing by BIRDS.

BIG OPERATIONS: Even the largest chemical and mining operations involving acres of space enjoy the advantages and savings of compact, self-contained, totally enclosed BIRD CENTRIFUGAL FILTRATION and CLASSIFICATION.

SMALL OPERATIONS: In a "packaged" salt refining plant, one small BIRD handles a ton per hour and the total plant occupies only 20 feet by 20 feet of floor space. BIRDS require no vacuum, no filter media, no auxiliary equipment.

The BIRD RESEARCH AND DEVELOPMENT CENTER is a complete, pilot scale test plant set up and staffed to supply quick, authentic answers on your filtration problems. *Why not make use of it?*

BIRD MACHINE COMPANY

SOUTH WALPOLE • MASSACHUSETTS

Her fingertips imagine the taste

The lady doesn't trust her eyes alone.

The buyer of Multiwalls is in much the same position.

Aside from package design, it's hard to tell one manufacturer's bag from another's simply by looking at it or fingering it.

Put the bags out of sight and you may be able to see many differences.

Men who buy 85 per cent of all Multiwalls consider* these intangibles more important than any other factor when they choose their supplier.

Invariably, these are among the first questions they ask . . .

"Is this company big enough?"

"Do they have a fair allocation policy?"

"Are their prices competitive?"

"Do they respect delivery dates?"

In a nutshell—

"Are they good people to do business with?"

We can't tell you what the answers are when these Multiwall users consider Union. This we do know . . . and the inference is yours to make—

In these days of industrial pressure, when *dependability* is a fervent wish as well as a word, men to whom Multiwalls are important are placing an increasing share of their orders with Union.

More so every day . . .

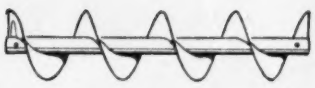
IT'S UNION FOR MULTIWALLS

TRADE MARK UNION

*August, 1951 research study.

UNION BAG & PAPER CORPORATION • NEW YORK: WOOLWORTH BUILDING • CHICAGO: DAILY NEWS BUILDING

See why Link-Belt screw conveyors are 8 ways better



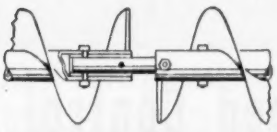
1. LOOK FOR UNIFORMITY OF PITCH

Specialized modern machinery assures accurate forming, producing uniform flighting curvature.

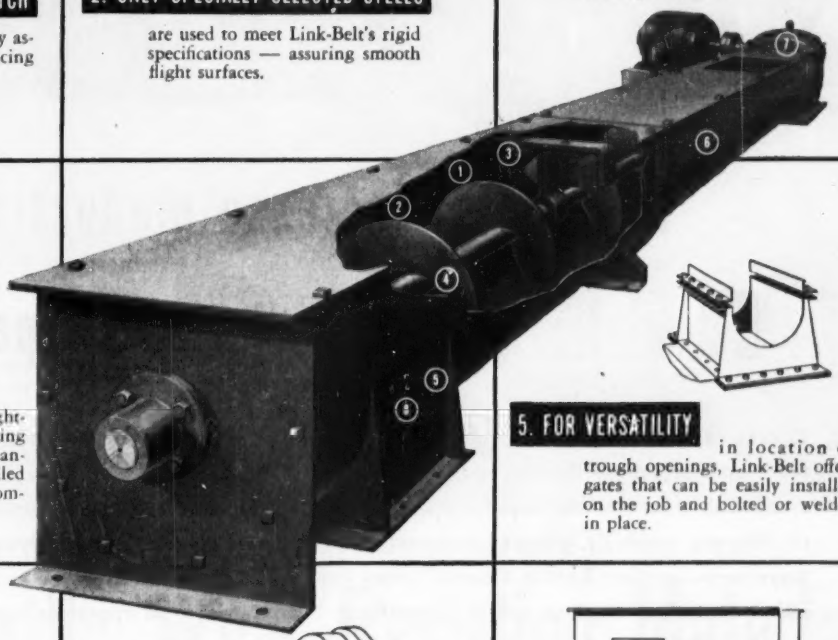
2. ONLY SPECIALLY SELECTED STEELS

are used to meet Link-Belt's rigid specifications — assuring smooth flight surfaces.

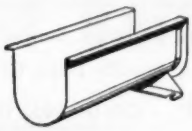
3. HERE'S A WIDE RANGE of hanger styles and mountings with various bearing materials.



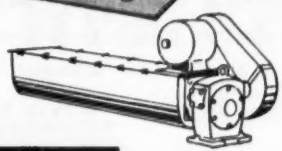
4. FOR YOUR PROTECTION straightness is checked before shipping and extra care is taken in handling and loading. Jig-drilled coupling bolt holes assure complete and easy assembly.



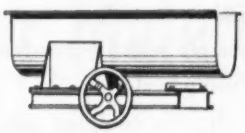
5. FOR VERSATILITY in location of trough openings, Link-Belt offers gates that can be easily installed on the job and bolted or welded in place.



6. YOU'LL DISCOVER that troughs are accurately fabricated to assure better fit of all components. Link-Belt offers a choice of metals to fit your particular application.



7. ONLY LINK-BELT builds a complete integrated line of gear and chain drives, couplings, bearings. One proved source . . . one undivided responsibility.



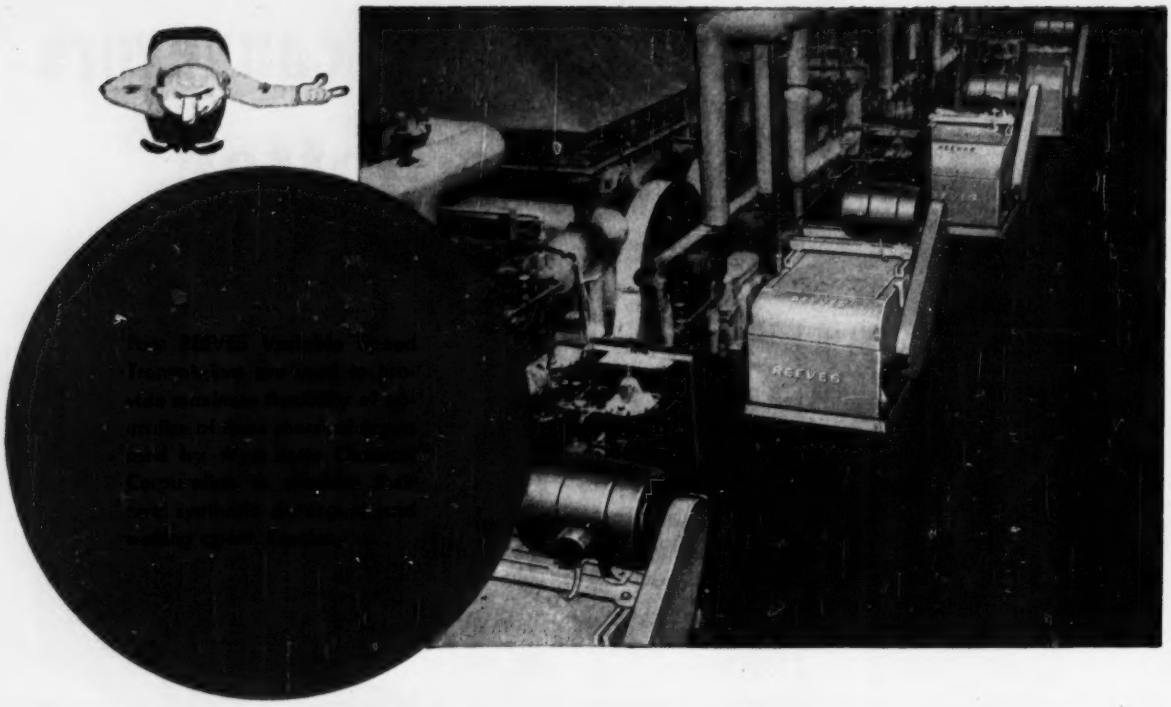
8. YOUR CHOICE of fixed or detachable plain discharge spouts or gates. Flat or curved slide type gates can be hand or rack-and-pinion operated.

LINK-BELT

SCREW CONVEYORS

These are only a few of the many important differences in screw conveyors. Ask your Link-Belt sales representative or distributor for new 92-page Data Book 2289.

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle; Scarboro, Toronto and Elmira, Ont. (Canada); Springs (South Africa); Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities. 19,378



Cut costs—increase production with

REEVES Variable Speed Control

REEVES Variable Speed Control makes your machines more accurate, more flexible, more productive . . . synchronizes them to the required speed and timing of different materials, shapes, sizes and operators. Anywhere—*anytime* REEVES Control gives you infinitely variable, stepless speed adjustability . . . simply with the touch of a button or the turn of a handwheel.

REEVES complete line includes a model for every specialized need—capacities up to 87 hp—speed ratios as great as 16:1 . . . is standard equipment on more than 2750 different makes of machines. Let a REEVES Engineer examine your speed control problems . . . show you how you can bring your machines, materials and operators into perfect synchronization . . . to cut costs . . . increase production. Send today for complete 132-page catalog. Specify Dept. CE58-1b-G.

REEVES PULLEY COMPANY · COLUMBUS, INDIANA

Choose from the complete line—REEVES!

NEW
Variable Speed Transmission for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Especially adaptable for heavy duty applications. Fractional to 87 hp.
Vari-Speed Motor Pulley converts any constant speed motor to an accurate, variable speed drive with 4:1 ratio. Rugged, dependable—sizes to 10 hp. Vari-Speed Jr. available for light machinery.
Motodrive combines motor, speed varying mechanism and reduction gears in one single, compact unit. Speed variations 2:1 to 10:1. Sizes from fractional to 30 hp.
Flexi-Speed Drive is the most versatile, most economical variable speed drive with 8:1 speed range. Mounts in any position . . . drives in any direction. Available in ½, ¾ and 1 hp.

So hard it cuts glass . . .

This striking photo demonstrates the extraordinary hardness of silicon carbide. As seen through a pane of glass, an exceptionally hard material itself, a chunk of natural silicon carbide crystals easily cuts the glass. That's why lining materials of silicon carbide are so highly resistant to wear.

Close to the diamond in hardness, silicon carbide is the . . .

Most Versatile, Wear-Resisting Material

Unique among man-made materials, silicon carbide offers exciting possibilities in applications where severe wear is a problem. Resistance to impinging solids, to corrosion, and to heat shock are some of its features . . . along with high load-carrying capacity.

Even under the toughest conditions of wear known, our CARBOFRAX® silicon carbide refractories have repeatedly outlasted special alloys and other materials generally considered to be highly durable. *This applies to room-temperature applications as well as to others ranging to above 3000 F.* It applies to wear caused by rubbing or sliding, and to wear caused by impingement of sharp particles traveling at high velocities.

For example: *In coke chutes and hoppers* that must withstand punishing cascades of sharp-edged coke . . . *in hot blast mains, blast furnace downcomers, and cyclone dust collectors* where abrasive dust is entrained in high-velocity gases . . . *in reheating furnaces* where metal slabs are pushed over skid rails or directly across the floor.

CARBOFRAX refractories are made in various thicknesses — are available as special, close-tolerance shapes, and as standard brick. They can also be supplied with interlocking joints. The coupon below will bring complete information. Why not check up? See how this unusual material can give real "armor-plate" protection.

CARBORUNDUM

Registered Trade Mark

Dept. H-14, Refractories Division
The Carborundum Company
Perth Amboy, N. J.

Please send descriptive data to:

Name_____

Position_____

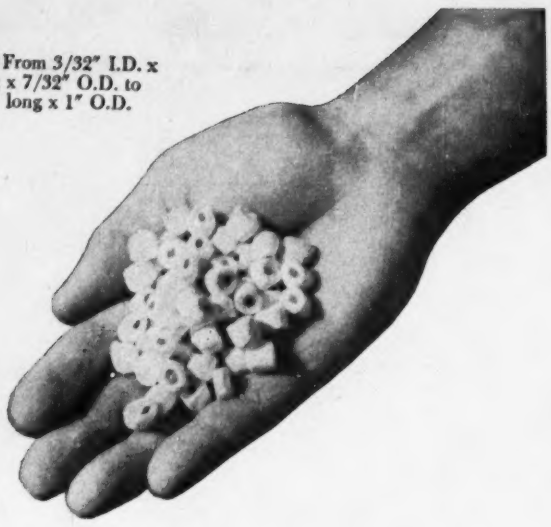
Company_____

Street_____

City_____ Zone____ State_____

RINGS. *Sizes:* From 3/32" I.D. x 3/16" long x 7/32" O.D. to ½" I.D. x 1" long x 1" O.D.

PELLETS. *Sizes:* From ⅛" x ⅛" to ½" x ½".



Rx for shorter contact time!

SPHERES. *Diameters:* ¼" to 1".

Norton specially engineered carriers bring proved advantages to a wide range of processes

Whatever your specific application may be, it will pay you to investigate the many advantages of Norton catalyst carriers.

Made of ALUNDUM* (fused alpha alumina), these highly refractory carriers are outstanding for heat conductivity, chemical inertness, mechanical strength and abrasion-resistance. And Norton's exclusive *controlled structure* process offers you a choice of porosities. In pellets and rings, porosities range from medium to high. In spheres, porosities range from medium, with rough exterior for coating with catalyst... to high, with a network of open pores and rough exterior for impregnating with catalyst.

Chemical engineers are finding this Norton "Special Refractory Prescription" invaluable in processing many different products. For example, in meeting the rapidly growing demand for phthalic anhydride, Norton catalyst carriers aid in shortening catalyst contact time and in achieving the highly exothermic reaction in fixed bed converters.

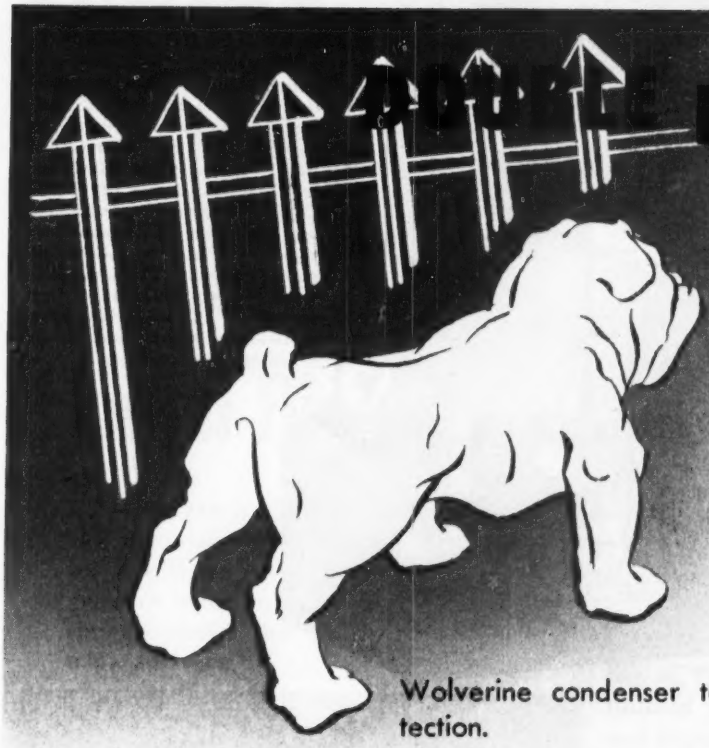
Test Them Out

Find out just what Norton ALUNDUM catalyst carriers can do for you. See your Norton Representative for samples, or write to NORTON COMPANY, 500 New Bond Street, Worcester 6, Mass.

Canadian Representative: A. P. Green Fire Brick Co., Ltd., Toronto, Ontario.

*Trade-Mark Reg. U. S. Pat. Off and Foreign Countries

NORTON
REFRACTORIES
ENGINEERED Rx PRESCRIBED
Making better products... to make other products better
NORTON COMPANY, WORCESTER 6, MASSACHUSETTS



double protection

Wolverine condenser tubes give you double protection.

Wolverine condenser tubes of copper and copper base alloys contain both arsenic and phosphorous—two of the best inhibiting agents that could be added to condenser tube alloys as protection against dezincification.

As you know, phosphorous is the best possible densifier of metal. It makes molten copper more fluid, and the resulting castings more sound and free of undesirable porosity. Arsenic, in itself a good inhibitor, is also added.

It adds up to double insurance or double protection by assuring a sound tube and resistance against dezincification.

Before retubing is necessary, write for Wolverine's new Condenser Tube Book. It's packed with information on sizes and alloys.

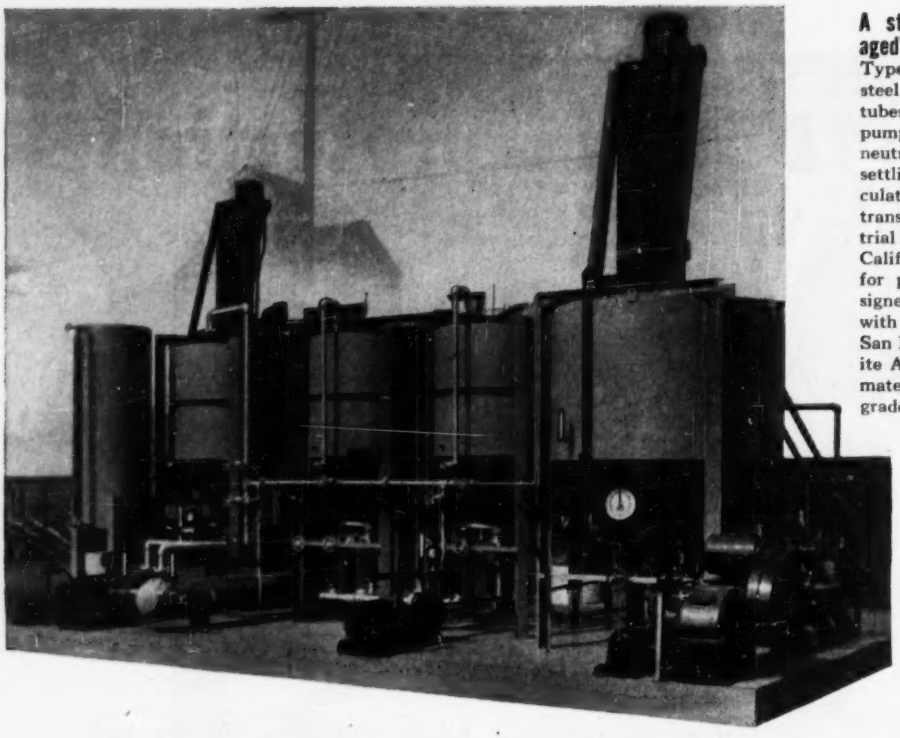
WOLVERINE TUBE DIVISION
of CALUMET & HECLA, INC.

ESTABLISHED 1916

Manufacturers of Quality-Controlled Tubing
1433 CENTRAL AVENUE • DETROIT 9, MICHIGAN

Plants in Detroit, Mich. & Decatur, Ala. *Sales offices in Principal Cities*

EXPORT DEPT., 13 E. 40th St., NEW YORK 16, N. Y.



A standard prefabricated "packaged" detergent plant . . . utilizing Type 316 chromium-nickel stainless steel for heat exchanger shells and tubes, sulfonator tank, neutralizer pump, seats and valves, hold tanks, neutralizer tanks, settling tanks, settling tank pumps, agitators, circulating pump on sulfonator, and transfer pump on hold tanks. Industrial Engineers, Inc., of Los Angeles, Calif., a manufacturer of equipment for production of detergents, designed this unit in collaboration with the Oronite Chemical Co., of San Francisco, producers of "Oronite Alkane" . . . a widely used raw material for manufacture of high grade detergent products.

How New Prefabricated Detergent Plant Licks Corrosion

Designed to produce indefinitely under severest conditions, this standard prefabricated detergent plant relies on an alloy containing nickel for corrosion resistance and protection against product contamination.

Peak performance, with a minimum of maintenance, is obtained by utilizing equipment fabricated from Type 316 austenitic chromium-nickel stainless steel...

For Type 316 stainless resists attacks by the extremely corrosive media encountered.

Throughout the process industries, low-cost operations result from using austenitic chromium-nickel stainless steels to defeat corrosion and assure maximum equipment life per dollar invested.

Stainless steels often permit making equipment lighter in weight without sacrificing strength or safety. When cold-worked they are strengthened and hardened, and a tensile strength in excess of 200,000 p.s.i. is easily developed. Annealed, and even in the cold-worked condition, they are adaptable to many forming operations. In all conditions they are readily weldable.

At elevated temperatures, austenitic chromium-nickel stainless steels are distinguished by their strength and outstanding resistance to oxidation. At temperatures down to −300°F. they retain their toughness and unusual strength.

Other elements are sometimes added to give specific properties: to improve machinability, enhance scaling resistance, improve resistance to corrosion in specific, difficult cases.

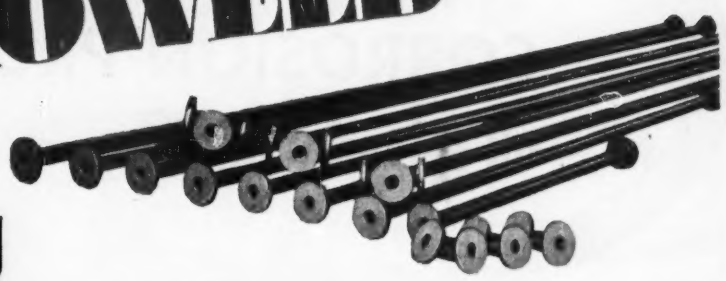
Leading steel companies produce austenitic chromium-nickel stainless steels in all commercial forms. A list of sources of supply will be furnished on request.

INCO

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N. Y.

You Can Save More with

PLIOWELD



Lined Piping

WHEREVER you handle corrosives, abrasive materials and other enemies of metal piping, it will pay you to investigate the savings you can make with PLIOWELD—Goodyear's lining material that bonds *permanently* to metal surfaces.

7 REASONS WHY
THE G T M. SPECIFIES PLIOWELD

1 Effectively seals in corrosives that cannot be handled in metal

2 Bonds permanently to metal surfaces an exclusive Goodyear process

3 Does not split or loosen with vibration or severe external impacts

4 Does not crack or buckle under alternate wetting and drying or under temperature changes

5 Surface will not disintegrate or slough off—*cannot ever contaminate in-process materials*

6 Protects product from discoloration, iron "pickup" and other contaminants

7 Each installation specially formulated to provide maximum protection against chemical handled

The G.T.M.—Goodyear Technical Man—will gladly discuss your problem—and recommend a PLIOWELD lining matched to your needs that will give you these benefits:

LOWER OVER-ALL COST because the useful life of PLIOWELD lined pipe so far exceeds unlined pipe that its slightly higher initial cost is more than made up by your savings in replacement outlays.

LOWER MAINTENANCE COST. Because PLIOWELD is absolutely impervious to corrosion, daily inspections and frequent maintenance shutdowns are eliminated. *The savings this means should cover the cost of* PLIOWELD *lining in a short time.*

IMPROVED PRODUCTION where PLIOWELD lined pipes handle production items. Your product is protected against taint and discoloration because the lining won't slough off or contaminate liquids.

Ask the G.T.M. about PLIOWELD lined pipes, fittings and equipment—everything from laboratory equipment to rail tank cars—or write Goodyear, Akron 16, Ohio.

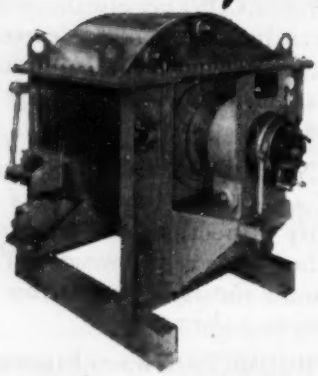
Pliowald—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

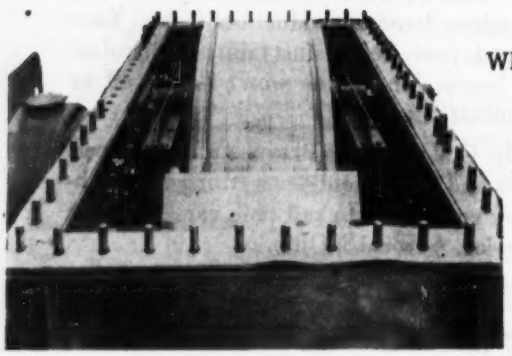
GOODYEAR

THE GREATEST NAME IN RUBBER

A COMBINATION OF CORROSION PROBLEMS
—all solved with *Carpenter* materials

sulphuric acid, nitric acid and potassium permanganate safely handled by Stainless #20





The materials handled by this continuous vacuum filter are not only corrosive but toxic. The principal corrodent in the filtrate is sulphuric acid (PH1). The solutions used for periodic cleaning of the filter are nitric acid and potassium permanganate.

To withstand this combined attack, all parts of the filter that come in contact with slurry, cake or filtrate are made from Carpenter Stainless #20—sheet, pipe, nipples, electrodes, rounds, etc. The hood to contain the gases is made from Carpenter stainless sheet, type 316.

Wherever corrosion is a problem, it will pay you to get in touch with your nearby Carpenter Distributor. He can put at your disposal our 25 years of experience in providing materials to withstand corrosion and the necessary "know-how" to fabricate them easily. The Carpenter Steel Company, Alloy Tube Division, Union, N. J.

Export Dept.: The Carpenter Steel Co., Port Washington, N.Y. "CARSTEELCO"

New 16-Page Book of Technical Data

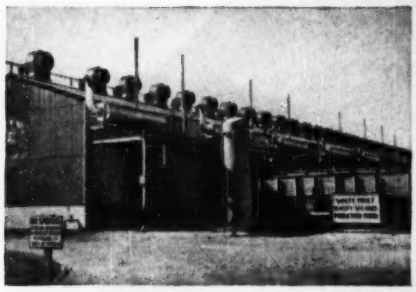
For complete information on No. 20 and the jobs it can do, write us a note on your company letterhead and ask for the new Carpenter Stainless No. 20 book.

Carpenter

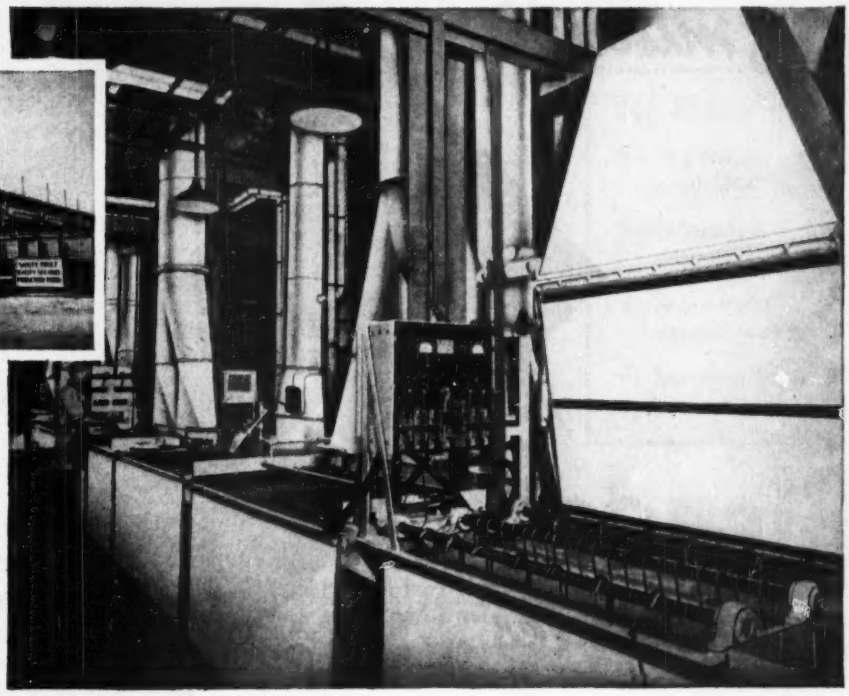
STAINLESS TUBING & PIPE — Analysis — Tolerance — Finish — **guaranteed on every shipment**

PUTTING *Air* TO WORK FOR

FUME CONTROL



General exhaust of an entire building where fumes are generated.



Exhaust system consisting of hoods, piping and fans, for collection of fumes and vapor at point of generation.

Improves Working Conditions
Eliminates Fire Hazards
Lowers Maintenance Costs

Proper fume control can eliminate fire or explosion hazards, improve employee health and morale through better working conditions, and lower maintenance costs. To help solve *your* fume control problem, Sturtevant has a wide background knowledge based on a variety of applications in many industries.

The systems pictured are equipped with Sturtevant fans (1) to collect and exhaust explosive fumes that result from processing operations dispersed throughout a general area, or (2) to carry off injurious vapors where individual operations generate corrosive or injurious smoke and fumes within a confined area. Whatever the application, Sturtevant can provide fans, exhausters and air handling apparatus to handle fume problems in your plant.

To obtain complete information on your problem, contact your local Sturtevant office, or write to Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Massachusetts.

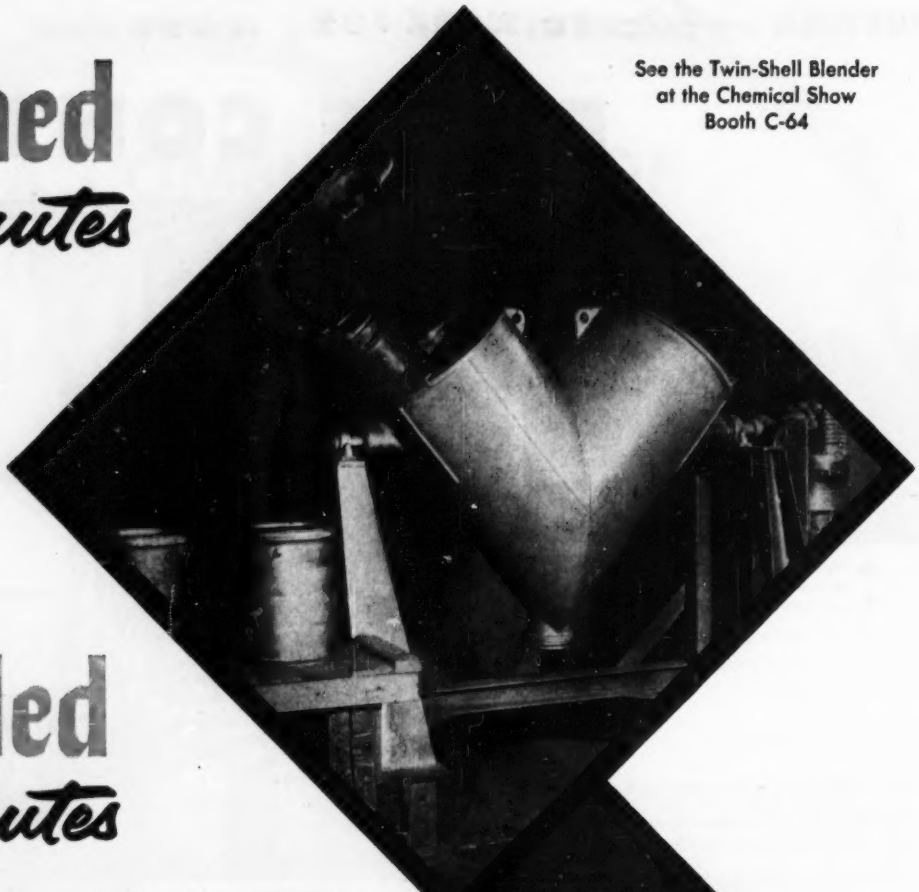
YOU CAN BE SURE...IF IT'S **Westinghouse**

PUTTING *Air* TO WORK

J-802018

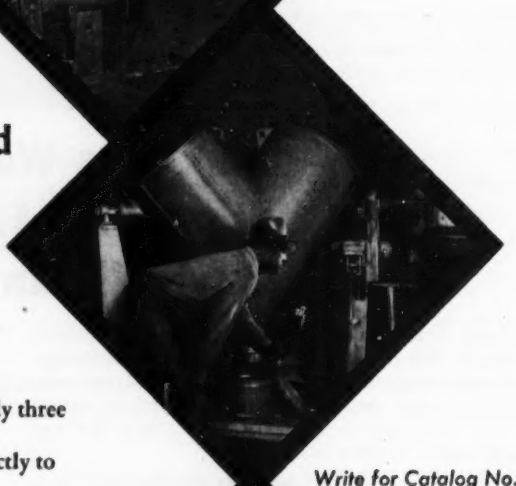
Cleaned in 3 minutes

See the Twin-Shell Blender at the Chemical Show Booth C-64



Blended in 3 minutes

vs 45 minutes by previous method



More thorough blending in *one-fifteenth* the time has been the experience of one manufacturer of hard-to-blend finely divided powders, assuring a completely thorough blend in three minutes that formerly required as much as 45 minutes to one hour and without any assurance of thoroughness. One blender replaces former methods which required a separate drum for every mix.

Now, clinical cleaning between batches is completed in only three minutes thanks to the baffle-free shell and the large charging openings. Discharge is also fast, with powders delivered directly to shipping containers on a scale platform.

In your own process work there is a place where p-k twin shell blenders can revolutionize your blending procedures. p-k maintains a blending laboratory where your blending problem can be pre-tested. Send a sample of your materials for a complete blending analysis, without obligation.

Write for Catalog No. 12

simply designed for better blending

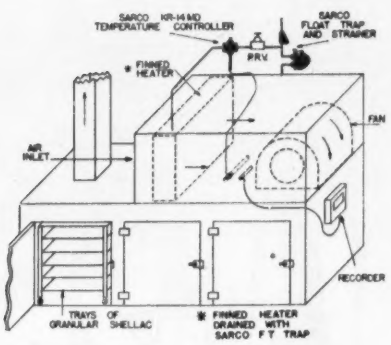
the **Patterson-Kelley Co.,** inc.

220 Lackawanna Avenue, East Stroudsburg, Penn.

© 1953

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities.

Misused steam plays havoc with production schedules and costs



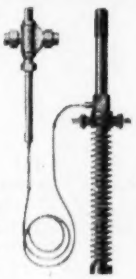
How Capital Shellac Maintains Uniform Drying

Capital Shellac, Bklyn, N. Y., was having difficulty holding even temperature in a shellac dry box. This box is used to remove moisture from granular shellac.

The problem was caused by periodic opening of doors and the inability of the control system to hold temperature constant under these conditions.

Sarco suggested the use of its KR-14-MD Temperature Controller set at 100°F using an extra sensitive bulb and closely balanced double-seated valve.

Mr. F. W. Davidson, Capital Shellac plant manager, reports that nearly constant temperature is now maintained and moisture uniformity accurately controlled.



Sarco Temperature Regulator KR-14-MD

Accurately controls air temperatures — hooked up with steam or brine lines, unit heaters or coolers, or air conditioning systems.

Use Steam Right

1. To prevent production delays
2. To improve product quality
3. To maintain desired output
4. To reduce labor and steam costs

IN YOUR processing operations, are you up against troubles such as slow-ups, uneven or inadequate heating, poor temperature control—resulting in reduced output, lowered product quality and increased costs?

You may suspect that your equipment is at fault. But process heating headaches often are due to ineffective utilization of steam. The wrong type trap can cause condensate to waterlog equipment. Improper air-venting can reduce the rate of heat transfer by as much as 11%. Manual temperature control may prove erratic, affect product quality, increase production costs.

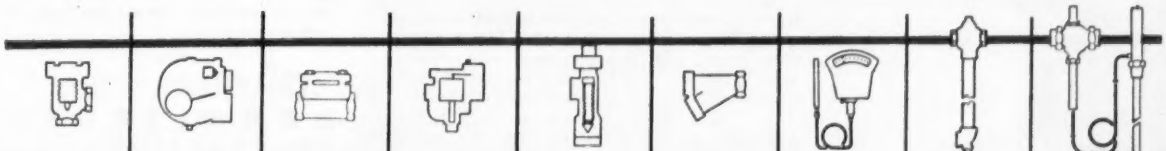
If your plant is suffering from any of these production handicaps, Sarco can help you. Sarco has a wealth of practical experience in the process industries to put to work for you. Plant after plant, with Sarco help, has licked these problems through simple, inexpensive changes. The results have been: increased output, improved product quality uniformly maintained, lower production costs.

Engineering Service: Our engineering service is yours for the asking. Call our local representative, or, write today for case histories describing how other plants in your field have solved similar problems through the proper application of steam traps and inexpensive temperature controls. Sarco Company, Inc., Empire State Bldg., New York 1, N. Y.

SARCO

improves product quality and output

STEAM TRAPS • TEMPERATURE CONTROLLERS • STRAINERS



Thermostatic Steam Traps | Float-Thermostatic Steam Traps | Thermodynamic Steam Traps | Camlift Bucket Steam Traps | Liquid Expansion Steam Traps | Strainers | Electric Temperature Controllers | Water Blenders | Self-Operated Temperature Controllers

NEMA-rated at 200 amps.

—but pulls 300 amps.!

Runs all day on one tank of gas!

New P&H WN-250 Engine-Driven

Here you get everything you've ever wanted in an engine-driven welder — including features you don't get from any other.

Take a quick look at some of the WN-250 advantages that help you keep step with demanding production schedules; help you cut costs:

(1) The P&H WN-250 has more capacity than other welders with the same rating.

(2) It has a full 20-gallon gas tank.

(3) It gives you the latest-type P&H welding generator, powered by a direct-connected gasoline engine. It's a four-cylinder, 180GLU Waukesha, water-cooled and built for heavy duty. And we really mean *heavy* duty — it's not an automotive light-weight. Available with electric starter.

(4) The WN-250 is equipped with a P&H idling device that establishes the rated speed of 1800 rpm as soon as the arc is struck. This speed is maintained for a set period after the arc is broken.

(5) It has P&H's famous Dial-lectric Control. An easy turn of a radio-type knob provides stepless heat adjustment over the entire high or low range.

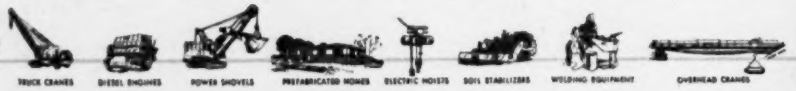
(6) It has pre-lubricated bearings, to reduce the need for servicing and insure longer life.

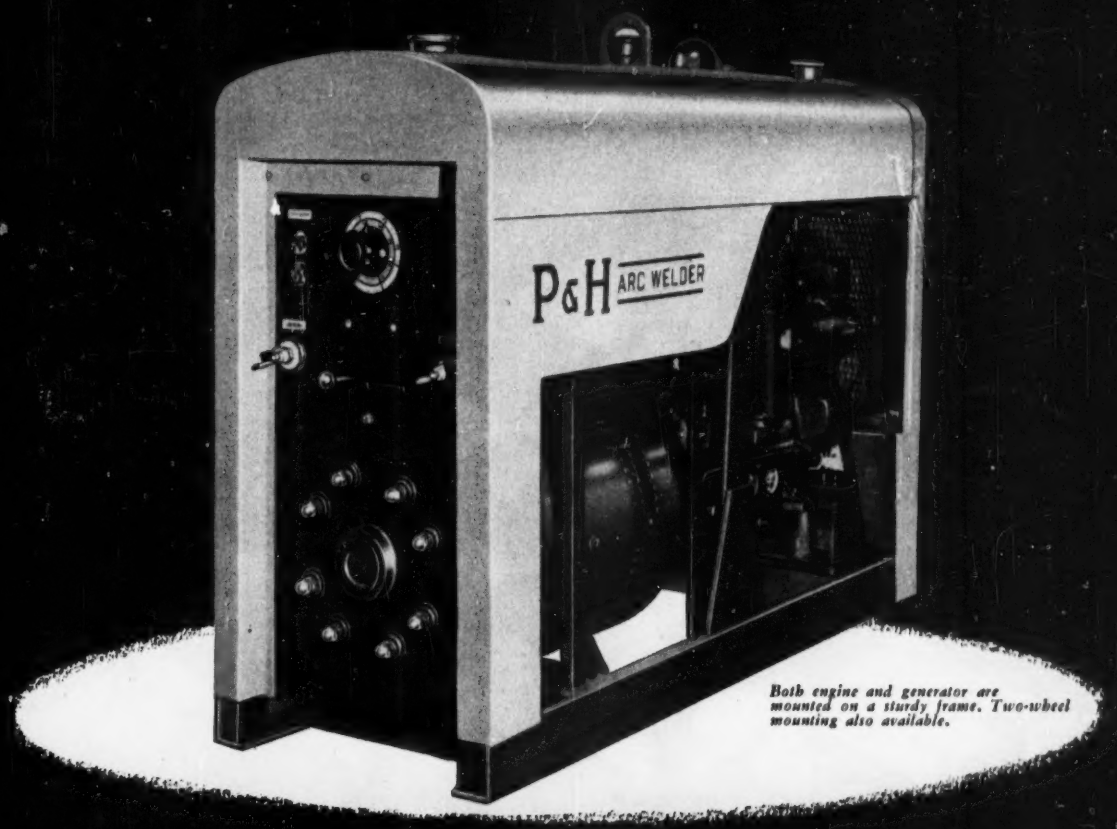
(7) It has an auxiliary AC power supply (1KVA) that permits floodlighting and running power tools, while welding.

There are other reasons why you're money ahead with a P&H WN-250. Ask your P&H representative or distributor for all the facts. Or, write for bulletin.

P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4487 West National Avenue • MILWAUKEE 46, WIS.

the P&H *Line*





Both engine and generator are mounted on a sturdy frame. Two-wheel mounting also available.

Arc Welder

America's most complete line of Arc-welding equipment and electrodes

Continuous 8-hour welding test demonstrates the extra stamina of the P & H WN-250

You can't beat welding performance like this: In a recent test, the P&H WN-250 operated continuously for 8 hours on a 70% duty cycle.

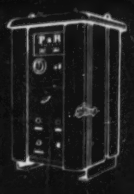
A 5/32" electrode was used with 300 feet of cable. There were 250 amps. at the electrode. So that the test would be continuous, three welding operators were used. When one got tired, another took over. All used the drag technique with a 6010 rod — which is as close to a short circuit as you can get.

At the end of 8 hours, the P&H generator was still cool. And the WN-250 was still rarin' to go — the weldors were worn out, but not the machine.

P&H AC WELDER

A full range of sizes up to 625 amps. (NEMA-rated). All are connectable to 220 or 440 volts. Dial-lectric Instantaneous Remote Control is fingertip control — gives you any heat you want—right at the work.

P&H DC RECTIFIER WELDER



Three sizes — 200, 300, and 500 amps. (NEMA-rated). No moving coils — no bearings, brushes, commutator, brush riggings, etc. Dial-lectric Control gives you finger-tip heat control at the work.

P&H POSITIONERS

One finger is enough to position heavy weldments for economical downhand welding. Capacities from 2500 to 36,000 lbs. — remote control and hand operated models.

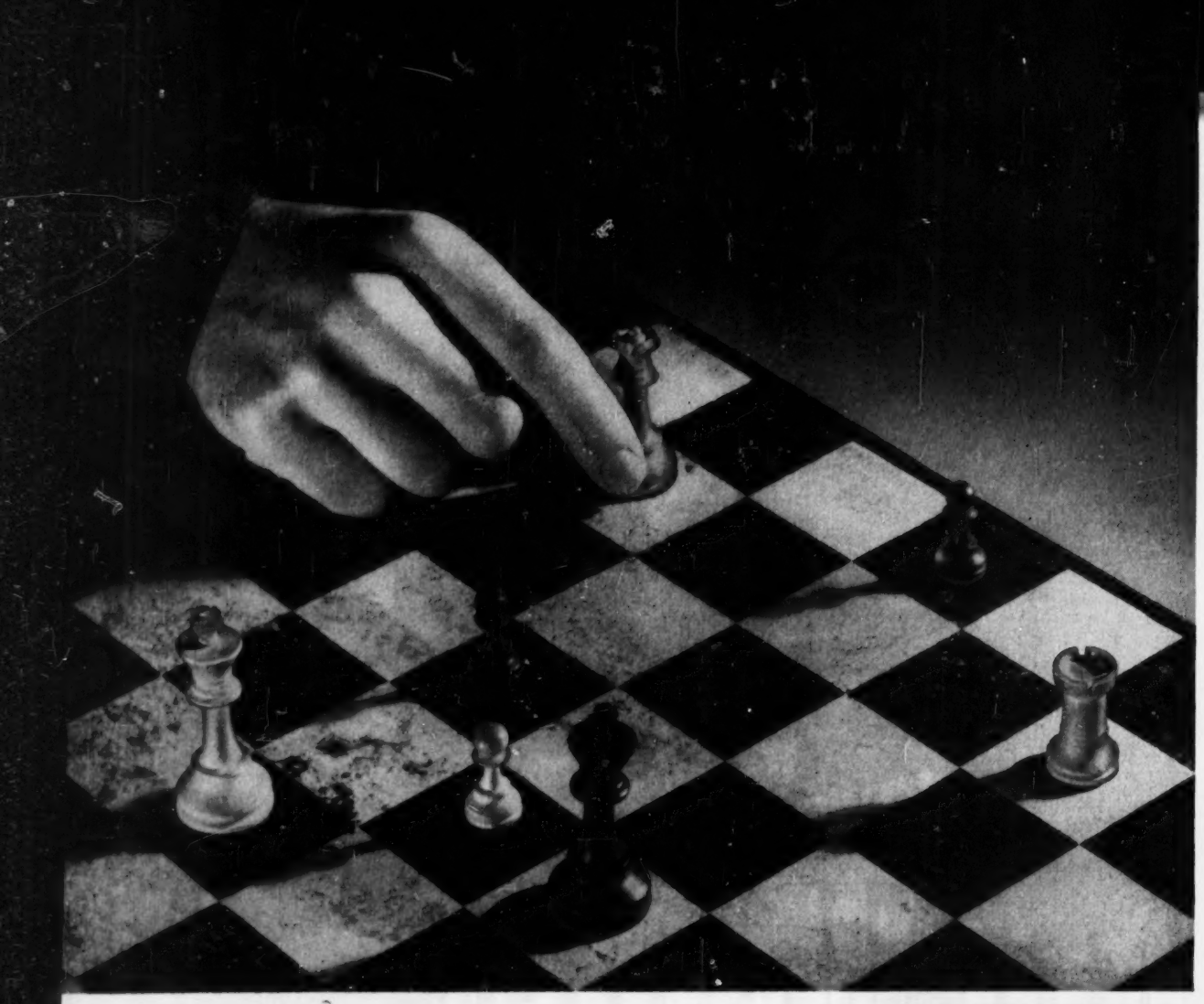
P&H ELECTRODES

A type and size for every job — to give you cleaner, sounder welds at lower cost on mild steel, cast iron, "hard-to-weld" steels, stainless steels, or hard surfacing.

P&H Welding equipment is manufactured and sold in Canada by

REGENT EQUIPMENT MANUFACTURING COMPANY LTD.

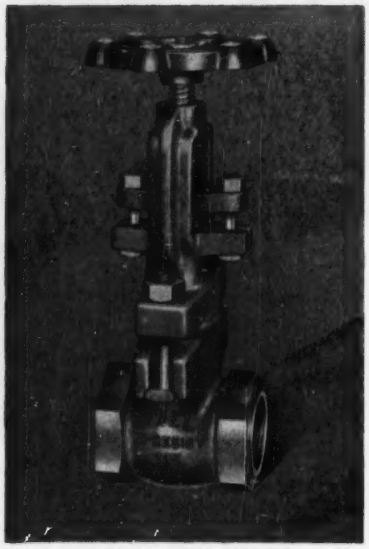
455 King Street • West Toronto, Ontario, Canada



CHECKMATE for corrosion

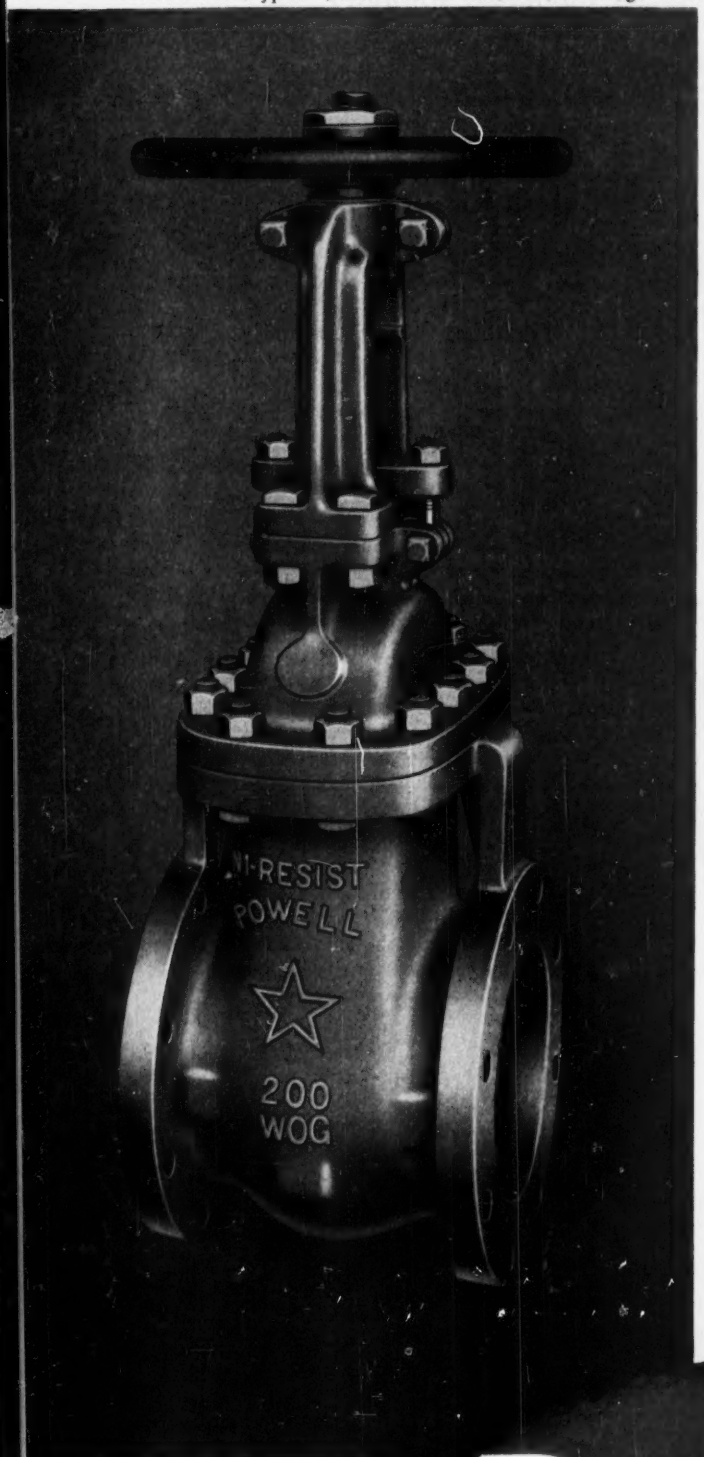
It's a winning move every time you select Powell *Ni-Resist* Valves. For here is an alloy that has far greater corrosion and heat resistance than ordinary Cast Iron. Similar to gray iron, and resembling austenitic stainless steel in many characteristics, no other cast metal offers such a unique combination of useful properties.

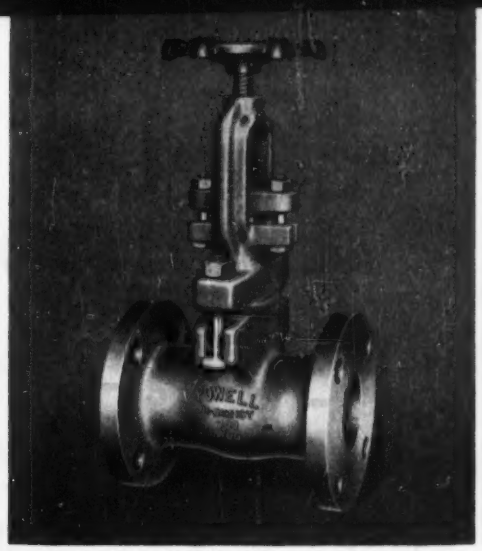
Powell Ni-Resist Valves are especially adapted for handling pulp and paper mill liquors, oil refinery acids, alkalies and sludges, caustic soda, pickling solutions, sea water and many other fluids. Shown here are just a few of them to help you checkmate the high cost of corrosion. They're available through distributors in principal cities. If a distributor is not located near you, just write us—The William Powell Company, Cincinnati 22, Ohio. We'll be pleased to tell you more about these valves—or to help you with your valve problems. Powell has probably solved more valve problems than any other organization in the world.



GATE VALVE *(Fig. 2194)* for 225 pounds W.O.G. Screwed ends, bolted flanged bonnet, inside screw rising stem. Body and bonnet are made of Ni-Resist, with 18-8S Mo Stainless Steel (Type 316) stem, seats, and wedge. Available in sizes ½″ to 2″, inclusive.

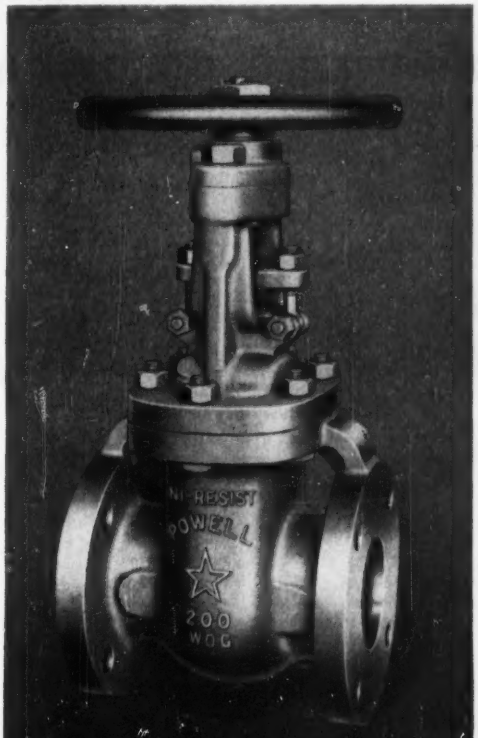
LARGE SIZE GATE VALVE *(Fig. 2193)* (5" to 12", inclusive) for 200 pounds W.O.G. Flanged ends, bolted flanged bonnet, outside screw rising stem and two-piece yoke. Ni-Resist body, bonnet, and yoke, with 18-8S Mo (Type 316) Stainless Steel stem, seats, and wedge faces.





GATE VALVE *(Fig. 2195)* for 200 pounds W.O.G. Flanged ends, bolted flanged bonnet, inside screw rising stem. Ni-Resist body and bonnet, with stem, seats, and wedge made of 18-8S Mo (Type 316) Stainless Steel. Sizes, 1" to 3", inclusive.

GATE VALVE *(Fig. 2193)* for 200 pounds W.O.G. Flanged ends, bolted flanged bonnet, outside screw rising stem and one-piece yoke. Body, bonnet, and yoke are Ni-Resist. Stem, seats, and wedge are 18-8S Mo (Type 316) Stainless Steel. Size, 4".



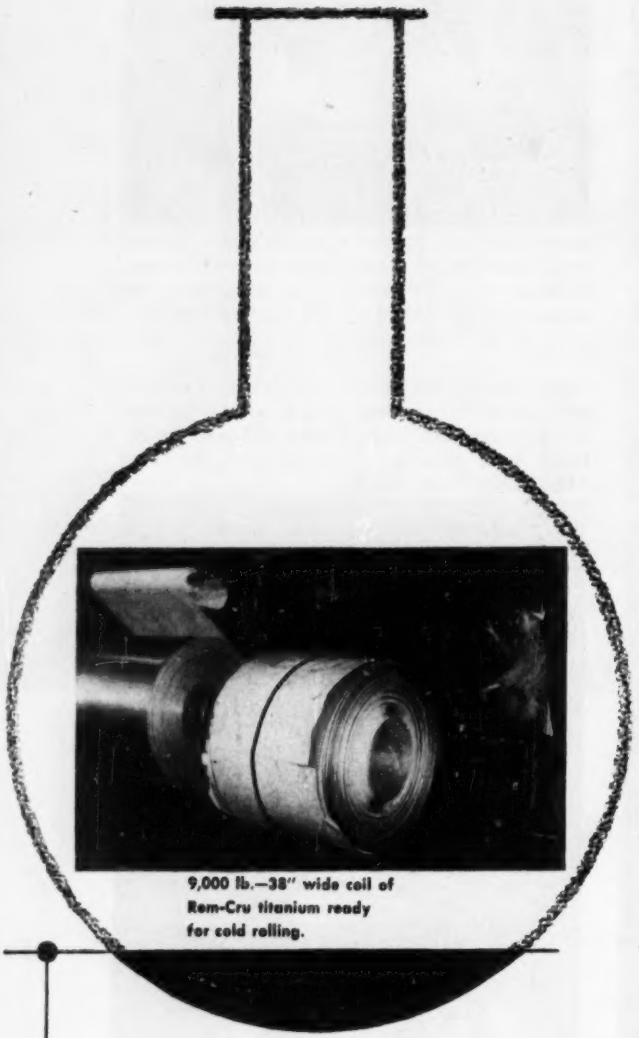
DEPENDABLE VALVES SINCE 1846

Powell Valves

THE WM. POWELL COMPANY • CINCINNATI 22, OHIO

REM-CRU TITANIUM

facts about a new metal for the chemical industry



9,000 lb.—38" wide coil of Rem-Cru titanium ready for cold rolling.

DURING THE PAST five years titanium has progressed from a laboratory curiosity to an accepted engineering material with an annual production of thousands of tons. Here are additional facts . . . presented by REM-CRU TITANIUM, INC.— a principal producer of this new metal.

Outstanding Properties—One of the most remarkable characteristics of titanium is its resistance to chloride solutions. It is completely unattacked in sea water—the only structural metal impervious to brine attack. Titanium is not corroded by most nitric acid solutions, wet chlorine and chlorine water, mixed sulphuric and nitric acids, ferric chloride, cupric chloride and almost all salts. It is not recommended, however, for service in mineral acids unless oxidizing agents are present, nor in formic acid or dry chlorine.

Titanium has another "good" point which makes it a valuable metal for the chemical industry. It retains useful strength up to 800-1000F, an important factor in the design of modern equipment.

Potential Applications—Most titanium produced to date has been for the aviation industry. However, many chemical engineers are studying and testing it to take advantage of its unique properties as promptly as possible. The density of titanium is only 60% that of steel while its strength, particularly in alloy grades, is greater than many steels.

Promising applications are condensers, evaporators, autoclaves, containers, tubing, valves and fittings. Field testing under individual plant conditions is constantly revealing new spots where the use of titanium can eliminate costly replacements.

Availability—Today titanium is available only in limited quantities for other than priority military applications. But production is increasing rapidly. REM-CRU has been producing 1200 to 1900 pound ingots for some time and last year melted the first 4000 pound ingot. This permitted commercial production of sheet in continuous coil form. REM-CRU titanium is produced in four grades, and in practically all forms—bars, plates, sheet, strip, wire, tubing, forgings and billets.

To keep abreast of the latest developments on this vital metal, write for the Rem-Cru Review—a free periodical devoted to the application and fabrication of titanium alloys.

REM-CRU TITANIUM **REM-CRU TITANIUM, INC., MIDLAND, PENNSYLVANIA**

LUBRICATE PLUG VALVES

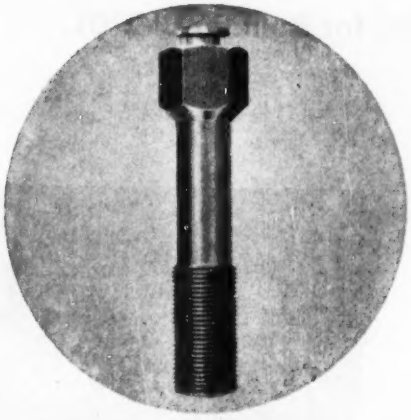
in seconds— instead of minutes

with this timesaving combination

Yes, seconds are all it takes to lubricate plug valves, today. You'll eliminate waste, and save time and effort with this combination: Walworth High Pressure Lubricant Gun, Walworth Button-Head Fittings, and Walworth Jumbo Size Lubricant Sticks. They'll pay for themselves quickly and are adaptable to most of the lubricated plug valves that are in use today.

Walworth High Pressure Lubricant Gun. This is the only gun available today that satisfactorily handles the stick form, full-bodied lubricants needed for proper lubrication and sealing of plug valves. Easy to operate; two Jumbo Size Lubricant Sticks fill the barrel.

Walworth Jumbo Size Lubricant Sticks. Individually wrapped and packed ten to the box; clean and easy to handle . . . eliminate messy loading. Types available for most line fluids. Always use Walworth Lubricants in Walworth Lubricated Plug Valves.



Walworth Button-Head Lubricant Fittings. Use them as lubricant fittings or as regular lubricant screws with standard size lubricant sticks. Just slip hose coupling onto fitting for a leakproof connection.

Start saving today . . . call your nearby Walworth Distributor. He'll be glad to supply Walworth High Pressure Lubricant Guns, Button-Head Fittings, and the right Jumbo Size Lubricant Sticks for any lubricated plug valve service condition.

WALWORTH

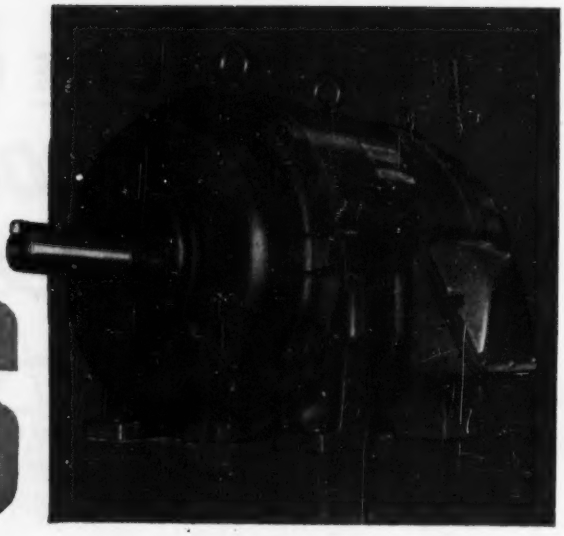
Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

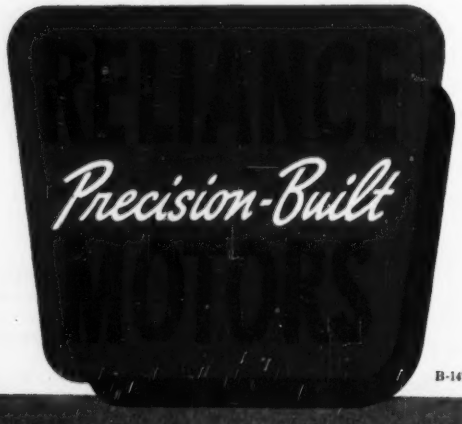
60 East 42nd Street, New York 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

"ALL MOTORS ARE NOT ALIKE!"



FOR RUGGED SERVICE, Reliance Motors are built better to last longer. These *Precision-Built* Motors combine maximum strength with shock-resistant frame and bearing-bracket construction. Write for Bulletin B-2101.



B-1470

RELIANCE ELECTRIC AND ENGINEERING CO.

1063 Ivanhoe Road, Cleveland 10, Ohio • *Sales Representatives in Principal Cities*

BENDS LIKE THIS

CAN CUT YOUR TUBING COSTS

It takes uniformly ductile tubing . . . easily workable . . . to make these hairpin bends. Uniform wall thickness is important, too. And so are uniform diameter, uniform concentricity and uniform strength.

You'll find all these features . . . and more . . . in Republic ELECTRUNITE Pressure Tubing. ELECTRUNITE Tubing has no hidden defects. It's made from flat-rolled steel that's inspected on both sides *before* the tubing is formed. Result: tubing that's free from scale, scabs and slivers . . . has a fine surface that helps resist corrosion . . . has no longitudinal thin spots.

Whether you're interested in re-tubing . . . or new equipment . . . it will pay you to specify ELECTRUNITE Pressure Tubes. Available in both carbon and various stainless analyses. Write for booklet CEC-53 for complete information.

STEEL AND TUBES DIVISION
REPUBLIC STEEL CORPORATION
203 EAST 131st STREET • CLEVELAND 8, OHIO

PRODUCED TO ASTM SPECIFICATIONS

CARBON
A-178
A-214

STAINLESS
A-249
A-269
A-312

REPUBLIC STEEL

ELECTRUNITE

ELECTRUNITE — THE ORIGINAL ELECTRIC WELDED BOILER TUBE

FOR SEWARD, ALASKA . . .
a 15% cut in generating cost!
OGDEN SAVES $10,000 A YEAR ON FUEL ALONE!
. . . with these Cooper-Bessemer Gas-Diesels
Here's how
Gowrie Protected Citizens Against Rising Power Costs!
GOOD NEWS for every town with a power proble
36¢ PER HORSEPOWER PER YEAR!
. . . that's the maintenance score at Cleveland Southerly Sewage Plant with Cooper-Bessemers on the job!
The Cooper-Bessemer Corporation
MOUNT VERNON, OHIO — GROVE CITY, PENNA.

Savings everywhere...

WITH COOPER-BESSEMER DIESEL AND GAS-DIESEL ENGINES

AS the months roll by, we try to bring to your attention some of the many Cooper-Bessemer installations that are saving big money everywhere. Reproduced on these pages are a few of the ads telling how and where.

If you were to study and compare these "case records", you'd discover a similarity . . . a pattern. Boiled down it is simply this . . .

Cooper-Bessemers are exceptionally trouble-free, requiring minimum supervision and maintenance. Their design combines ruggedness with a *compactness* that cuts the cost of installation and housing. Finally, you get the full economy in fuel, lube and cooling cost that is possible only with the highest operating efficiencies reached today. And *that's* big!

Our nearest office is always glad to give you specific details on the Cooper-Bessemer units best suited to your power needs for today or tomorrow.

MOUNT VERNON, OHIO
COOPER-BESSEMER
GROVE CITY, PENNA.

New York Washington, D.C. Bradford, Pa. San Francisco Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle Shreveport St Louis Los Angeles Chicago Cooper-Bessemer of Canada, Ltd., Halifax, Nova Scotia Tulsa Gloucester, Mass. New Orleans, La.

Hominy saves $1148 a month on fuel with Cooper-Bessemer gas-diesel
How McGregor turned a Power Problem into $10,000 yearly profit!

Once is not enough!

The need for blood is greater than ever, not only for men wounded in combat, but here at home . . . to cure disease, to meet accidents and disasters, and to prepare for civil defense.

Our quota can ONLY be met, if those who give *keep on* giving . . . regularly!

You CAN give more than once . . . as often as every three months with complete personal safety. The more often you give the more often you save a life. For every pint of blood you give goes to someone who needs it desperately.

Remember . . . once is NOT enough. Give blood again and again! Call your Red Cross, Armed Forces or Community Blood Donor Center for an appointment to give blood today.

GIVE BLOOD

...give it again and again

BUSINESS EXECUTIVES!

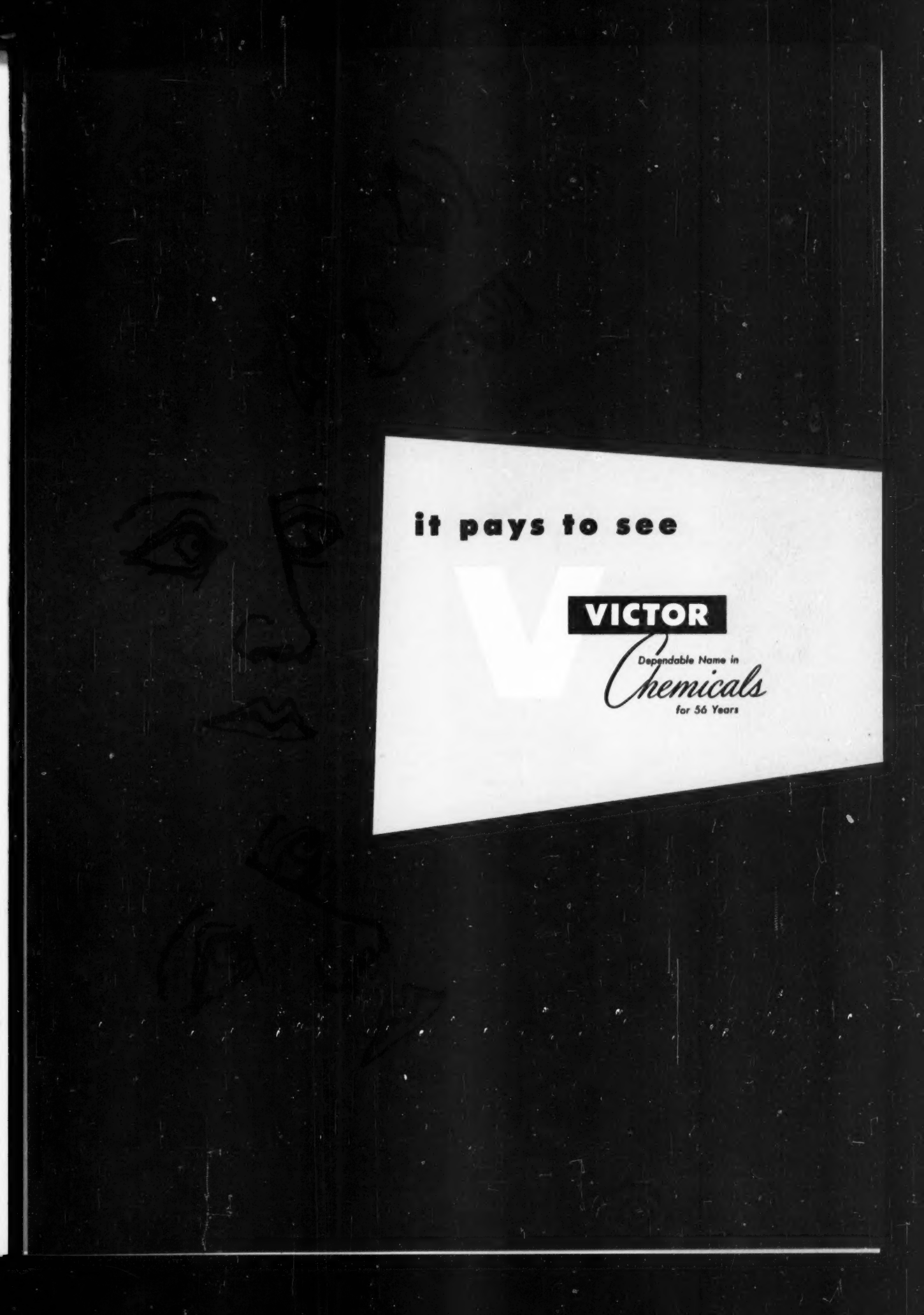
CHECK THESE QUESTIONS

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ◯ HAVE YOU GIVEN YOUR EMPLOYEES TIME OFF TO MAKE BLOOD DONATIONS?
- ◯ HAS YOUR COMPANY GIVEN ANY RECOGNITION TO DONORS?
- ◯ DO YOU HAVE A BLOOD DONOR HONOR ROLL IN YOUR COMPANY?
- ◯ HAVE YOU ARRANGED TO HAVE A BLOOD-MOBILE MAKE REGULAR VISITS?
- ◯ HAS YOUR MANAGEMENT ENDORSED THE LOCAL BLOOD DONOR PROGRAM?
- ◯ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ◯ WAS THIS INFORMATION GIVEN THROUGH PLAN BULLETIN OR HOUSE MAGAZINE?
- ◯ HAVE YOU CONDUCTED A DONOR PLEDGE CAMPAIGN IN YOUR COMPANY?
- ◯ HAVE YOU SET UP A LIST OF VOLUNTEERS SO THAT EFFICIENT PLANS CAN BE MADE FOR SCHEDULING DONORS?

Remember, as long as a **single** pint of blood may mean the difference between life and death for **any** American . . . the need for blood is **urgent!**

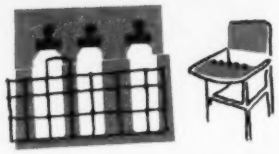
NATIONAL BLOOD PROGRAM


it pays to see
VICTOR
Dependable Name in
Chemicals
for 56 Years

DISODIUM PHOSPHATE, DUOHYDRATE

Anhydrous disodium phosphate is a white, crystalline material of food grade purity. Also available, disodium phosphate duohydrate, a white, crystalline material which complies with Food and Drug Laws in purity.

USES: Boiler water treatment. Tin weighting of silk. Textile process waters. Buffer in dye-baths. Casein emulsifier. Processing of cheese. Manufacture of pharmaceuticals, and evaporated milk. Pumping pickle for canned meats.



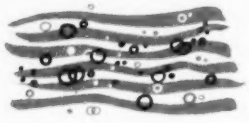
A Phosphate Makes the Difference

A baby's appetite demands only one food . . . milk. As a substitute for mother's milk, many doctors recommend a formula based on evaporated milk. The creamy, uniform quality of evaporated milk is made possible with the use of an emulsifier, disodium phosphate. Victor is proud to produce this phosphate that meets the high purity and uniform quality standards required by the industry. Disodium phosphate also finds wide application in the production of process cheese. It pays to see Victor.

SODIUM TRIPOLYPHOSPHATE

Sodium tripolyphosphate anhydrous, powdered or granular.

USES: Soap builder. Manufacture of detergents and water softeners. Purification of china clay. Conditioning oil drilling muds. Particularly effective in bar soaps; will not crystallize nor bloom. Disperses soap curds in hard water and eliminates scum. Clay dispersant. Deflocculant in raw cement slurries. Anti-pitch agent in paper making.



A Clean Story

Combine soap and hard water and you are asking for *trouble!* Soap plus hard water produces insoluble curds. These curds cause "tattle-tale gray" and in time they tend to "gum up" washing machines. Victor is proud of the important role that its phosphates have played in the development and growth of detergents. Victor sodium tripolyphosphate and tetrasodium pyrophosphate are well known by builders of detergents for their ability to produce a sweeter, cleaner, whiter wash. It pays to see Victor.

PLANT FOOD COMPOUND

Take-Hold® is a combination of pure, crystalline ammonium and potassium phosphates, completely soluble in water, giving a substantially neutral solution.

Typical analysis: N 10%
P_2O_5 52%
K_2O 17%

USES: Starter solution and plant food for tomatoes, tobacco, cabbage, eggplants, floral plants, etc. Produces earlier fruiting and larger yields.

How to Get a Head Start

With home gardeners the motive is pride! With commercial growers, it's profit. But both delight in harvesting a bumper crop ahead of competition. And both accomplish this objective when they use Victor's "Take-Hold" . . . the special plant food that produces a head of cabbage fast and speeds early yields of tomatoes, cauliflower and other crops grown from transplants. Take-Hold is widely used by both commercial and amateur gardeners for faster growth, greater yield, fewer plant losses. It pays to see Victor.

$Na_2H_2P_2O_7$

SODIUM ACID PYROPHOSPHATE

TRADE MARKS — Victor Cream, Perfection, B. P. Pyro

Victor sodium acid pyrophosphates are white powders whose purity meets the requirements of the Federal and State Pure Food Laws.

USES: Baking acid for doughnut flours, prepared flours. Manufacture of commercial baking powders, and baking creams. Conditioning oil well drilling muds. Acid type metal cleaner.

Here's Mud in your Oil Well

Custom-made mud for oil well drilling is almost worth its weight in gold. The mud washes the hole clear of cuttings and returns them to the top. It builds a protective wall against the side of the hole to guard against cave-ins and holds back gas pressures. To control mud viscosity, Victor sodium phosphates are added as needed. The oil industry is another field where Victor chemicals fill a need. It pays to see Victor.

$POCl_3$

PHOSPHORUS OXYCHLORIDE

Phosphorus oxychloride is a water-white to slightly yellow liquid whose vapors are very irritating. It decomposes in water to yield phosphoric and hydrochloric acids, and is chemically very reactive.

USES: Intermediate in production of organic chemicals. Chlorinating agent. Catalyst.

From Phosphates to Pharmaceuticals

Phosphates have played an important role in the synthesis of many of the modern "miracle" drugs used today. For example, phosphorus oxychloride acts as an intermediate in the production of sulfa drugs and in the synthesis of atabrine, the anti-malarial specific. Two other Victor products play important roles in modern medicine development . . . phosphoric acid in the production of penicillin and formic acid in the production of new "allergy" drugs.

$CaH_4(PO_4)_2$

MONOCALCIUM PHOSPHATE, ANHYDROUS (Heat-treated)

TRADE MARK—V-90®

(U. S. Patents 2160700 and 2160232; Canadian Patents 388809 and 388810)

V-90 is a fine, white, free-flowing powder, each particle of which has a thin, continuous coating of a relatively insoluble phosphate which delays solution when aqueous liquids are added. This makes possible a delayed leavening action.

USES: Manufacture of self-rising flour, self-rising corn meal, pancake flour, prepared mixes, household baking powder, phosphated plain flour, and bakers' angel food cakes. As an ingredient of baking preparations. (U. S. Patents 2160700-1 and 2160232-3)

Light as a Bride's Biscuits?

In the South, especially, even a bride's biscuits are almost certain to be feather-light and tender. This is because most southern folks buy their flour with salt and special baking powder already mixed in by the miller. One of the ingredients is Victor's V-90 phosphate . . . the world's only slow acting monocalcium phosphate.

VICTOR

Dependable Name in Chemicals

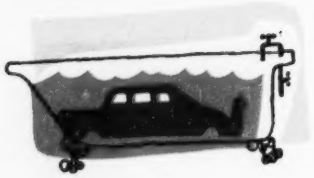
for 56 Years

PHOSPHORIC ACID

Phosphoric acid is a clear, colorless, sparkling liquid. All grades meet the requirements of the Federal and State Pure Food Laws.

Concentrations: 75%, 80%, 85% N.F.
115% (Polyphosphoric)

USES: Manufacture of yeast, sugar, soft drinks, imitation jellies, gelatin, and pharmaceuticals. Rustproofing, engraving, railroad car cleaning, refining oil and gasoline, preserving silage. Weighting silk, and dyeing textiles. Chemical polishing and electro-polishing metals, bright-dip baths for aluminum. Manufacture of phosphates, dental cements, glue, ceramics, glass, metal treating compounds, explosives, and fertilizers.



One Bath Lasts a Lifetime

The beauty and durability of metal products such as refrigerator shells, automobile bodies and the like, is due in part to a phosphoric acid bath given the metal just before paint is applied. This bath produces a rust-resistant coating on the shell that provides a better bond for the paint. Thus, blistering and chipping, due to an improperly prepared surface, is avoided. For years Victor has been the principal supplier of phosphoric acid to the metal industry. It pays to see Victor.

FLAMEPROOFING COMPOUNDS

Fyrex

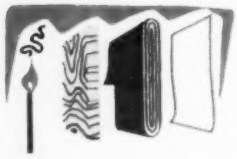
TRADE MARKS

Fyrex®—a neutral ammonium phosphate.

Flexible Fyrex®—regular Fyrex to which a softening agent has been added.

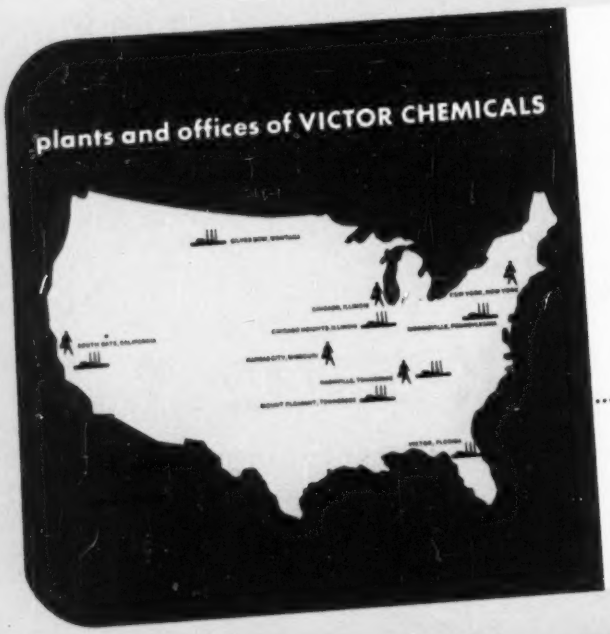
Special Flexible Fyrex®—regular Fyrex to which a softening agent has been added, plus a penetrating agent.

USES: Flameproofing of textiles, paper, wood, and vegetable fibers. Applied to paper, fabrics, or insulating materials by dipping, spraying, or contact rollers; to wood under pressure in autoclaves.



Burning Question

Ammonium phosphates are among the most effective flameproofing agents known. Victor ammonium phosphates, as well as special compounds like the Fyrex Group and Victamide®, have found wide use in industry. Alert manufacturers seeking a new sales appeal for their products have found that flameproofing them with Victor's flameproofing agents turned the trick. Materials for insulation, paper, wood, and textile products are among the many items that lend themselves to flameproofing. It pays to see Victor.



it pays to see

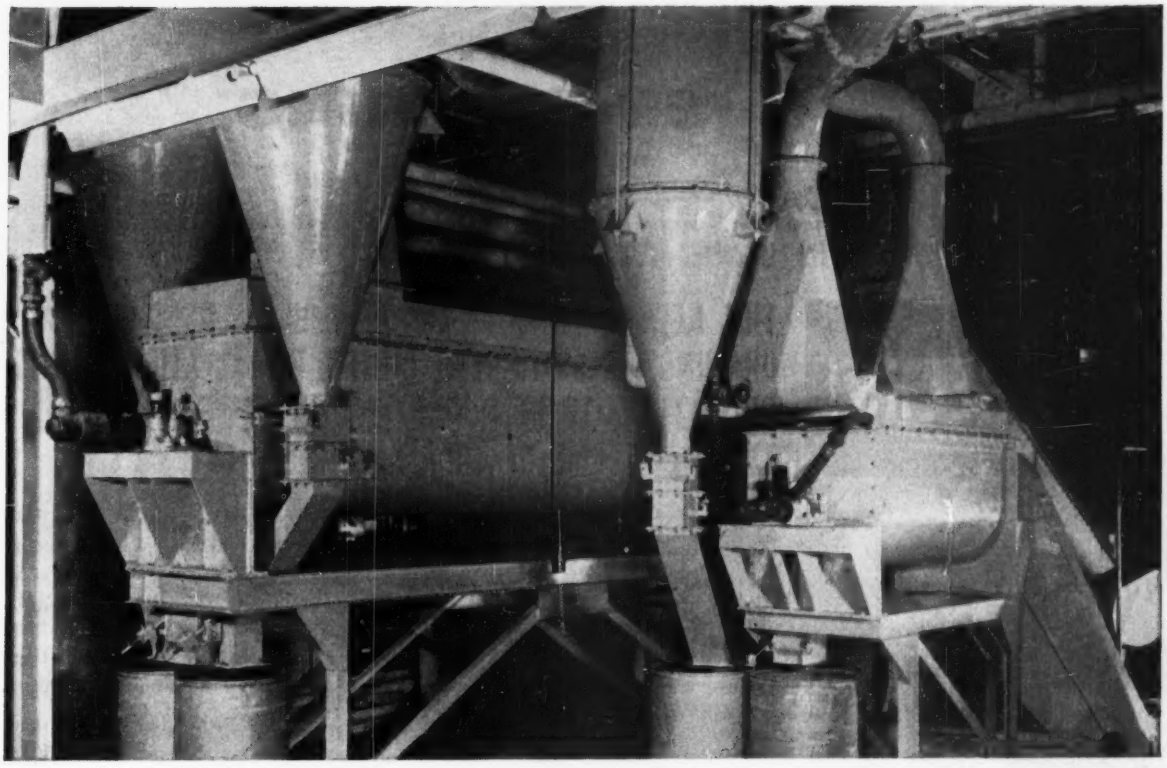
VICTOR

Dependable Name in *Chemicals* for 56 Years

VICTOR CHEMICAL WORKS

141 West Jackson Boulevard

Chicago 4, Illinois

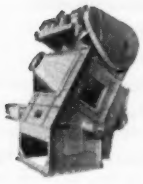


Midwest manufacturer saved enough in six months to pay for this two-unit Monotube installation. Solvents, formerly lost in processing, are recovered by drying.

Here's double assurance of the *correct* dryer for your process

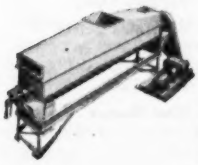
ROTO-LOUVRE

Drum design provides aerated mass drying. Will not damage heat-sensitive materials. Gradual, positive heat transfer prevents case-hardening. Ask for Book 1911-B.



MULTI-LOUVRE

For rapid treatment of large quantities of material. Uniform, constant agitation promotes efficient, uniform drying with minimum degradation. Ask for Book 2409.



MONOTUBE DRYER

For small, inexpensive installations. Excellent for fine-particle materials. Minimizes dusting. Equally effective at high or low temperatures. Ask for Book 2413.

LINK-BELT builds 3 types ..offers free testing service

No single dryer can meet all processing conditions—or dry every kind of material. That's why Link-Belt builds three types of dryers—Roto-Louvre, Multi-Louvre and Monotube. Each has specific advantages . . . provides drying service that matches particular production processes. In addition, we offer a free laboratory analysis of your material. We'll test it by utilizing our laboratory facilities . . . work out procedures that can be duplicated in your plant. Ask for this free service today. Simply send samples of your material, a pound or a ton, or call the nearest Link-Belt office for further details.

LINK-BELT

DRYERS • COOLERS • ROASTERS

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices in Principal Cities. 13,139

TRADE PAPER EDITION
Published by
SCHUTTE and KOERTING
Company

ENGINEERING *News*

JET APPARATUS • HEAT TRANSFER EQUIPMENT • STRAINERS • CONDENSERS AND VACUUM PUMPS • OIL BURNING EQUIPMENT • ROTAMETERS • FLOW INDICATORS • RADIAFIN TUBES • VALVES • SPRAY NOZZLES AND ATOMIZERS • GEAR PUMPS • DESUPERHEATERS

ENGINEERS!

THIS NEW BULLETIN ON SK GEAR PUMPS USES CUT-AWAY DRAWINGS, EASY-TO-READ TABLES, INSTALLATION PHOTOS, CRISP TEXT, TO HELP YOU ANALYZE ALL AVAILABLE TYPES IN TERMS OF YOUR REQUIREMENTS

While preparing this bulletin, we at SK checked with numerous users of SK Gear Pumps to obtain factual operating data.

A particularly pertinent interview was one we had with a company president whose comment offers a good clue to the way these pumps are engineered and built. He told us—

"I have more orders for my equipment than we can take care of right now and one of the reasons is because our machines stand up exceptionally well under some of the toughest conditions you can find in the ..... industry. We use SK Gear Pumps as original equipment on our machinery and I'm glad to be able to tell you that they are a major contributing factor to the efficiency and long-lasting characteristics of our machines."

SK Gear Pumps *are* well made. And, they are versatile for they can be constructed to handle materials ranging in viscosity from 30 to 10,000,000 S. S. U. Further, depending upon the material handled, capacities can range from 1 gph to 1000 gpm and pressures to 3500 psi.

Possibly you are familiar with the reputation these pumps have earned in the power field. But, do you know that hundreds of them are being used in the petrochemical industry, the food industry, in textiles, in the chemical process and other industries for pumping materials such as grape juice, tar, catsup, and the others listed in the box below.

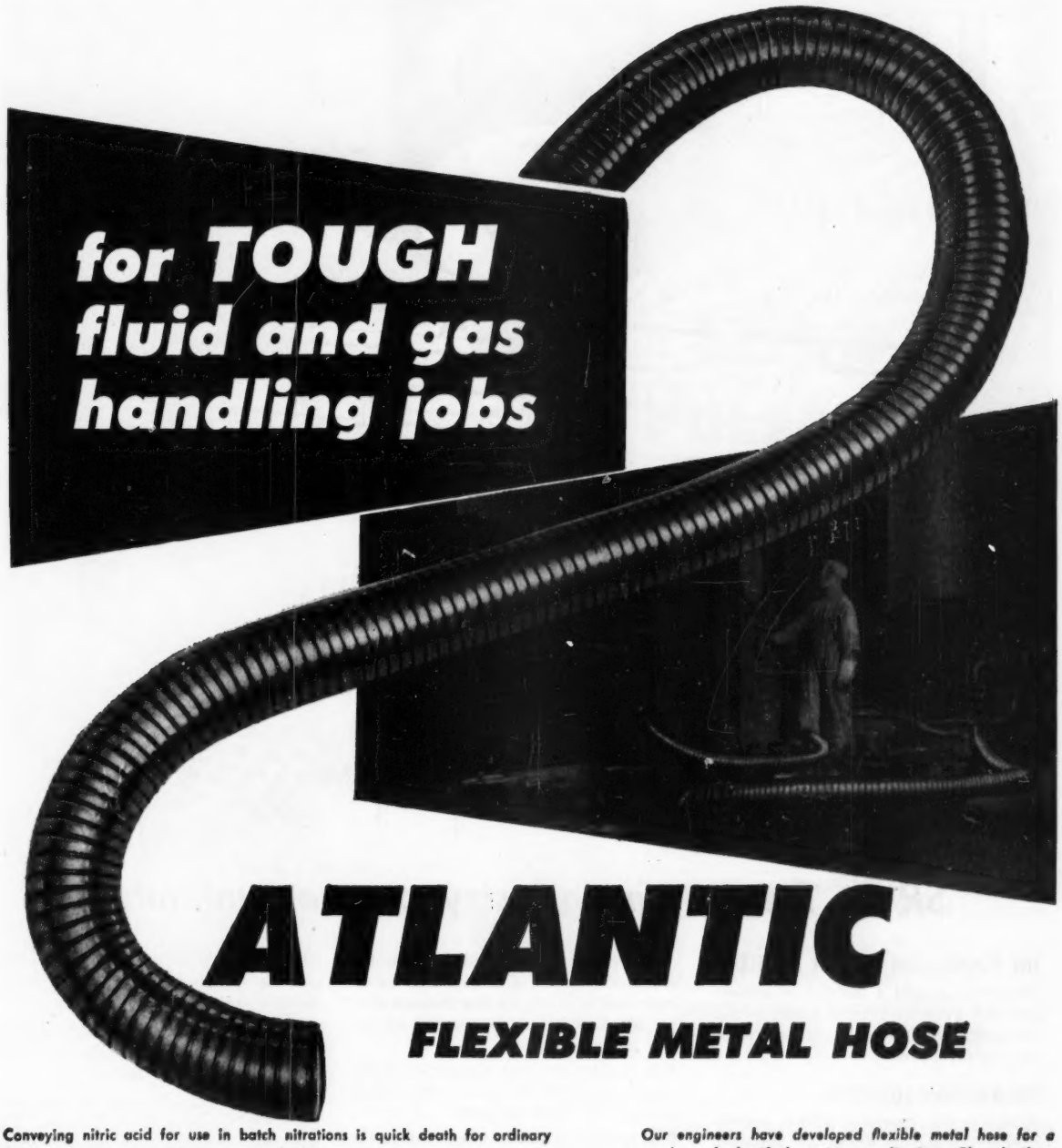
In Bulletin 17-A, we have included material which will help to acquaint you with the types and sizes available, their characteristics and uses. If you can use a copy, drop us a line at the address below. We will send it immediately.

Here are some of the many materials now being handled by SK Gear Pumps:

- Alcohol
- Asphalt
- Benzine
- Black Strap Molasses
- Catsup
- Caustic Soda Solution
- Cellulose
- Coal Tar
- Coolants
- Cotton Seed Oil
- Dopes (with viscosities to 10 million S.S.U.)
- Finished Resin
- Fuel Oils, all grades
- Glue
- Glycerol Water Mixture
- Gum Caustic Mixture
- Heated Oils
- Hydraulic Oil
- Kerosene
- Linseed Oil
- Lubricating Oil, all grades
- Molasses
- Mucilage
- Paint
- Propane and Wax Slurry
- Quenching Oils
- Rayon Solution
- Road Tars
- Shortening
- Solvents
- Soap Solutions
- Soup
- Syrup
- Tar Oil
- Textile Oils and Compounds
- Tomato Juice
- Varnishes
- Vegetable Oils
- Vegetable Juices
- Wax
- Wood Tar
- Wool Grease

SCHUTTE and KOERTING Company
Manufacturing Engineers
21 STATE ROAD
CORNWELLS HEIGHTS
BUCKS COUNTY, PA.
Representatives in Principal Cities

for TOUGH fluid and gas handling jobs



ATLANTIC

FLEXIBLE METAL HOSE

Conveying nitric acid for use in batch nitrations is quick death for ordinary flexible metal hose. Sulphuric acid and plating solutions are other notorious killers. When temperature and pressure extremes and adverse handling conditions are also involved, hose replacement is frequent and expensive.

That's why—for tough jobs—it's good economy to specify Atlantic flexible metal process hose. Manufactured to survive the most destructive use, it is unequalled for leak-proof qualities, flexibility, durability, strength and lightness. It performs long after ordinary hose is scrapped and returns real savings in your material and labor dollar.

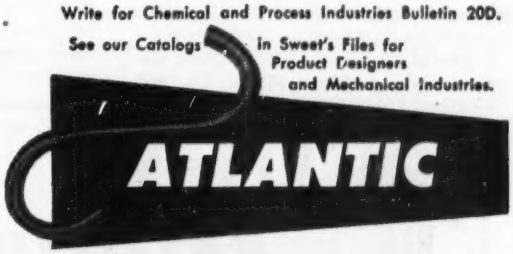
Whatever your application — conveying, controlling movement and vibration, correcting misalignments, compensating for expansion and contraction — *there is an Atlantic flexible metal hose that is best for it.*

Available in Seamless or Interlocking construction: Steel, stainless steel, monel, bronze. ⅛"—36" I.D. inclusive with appropriate fittings.

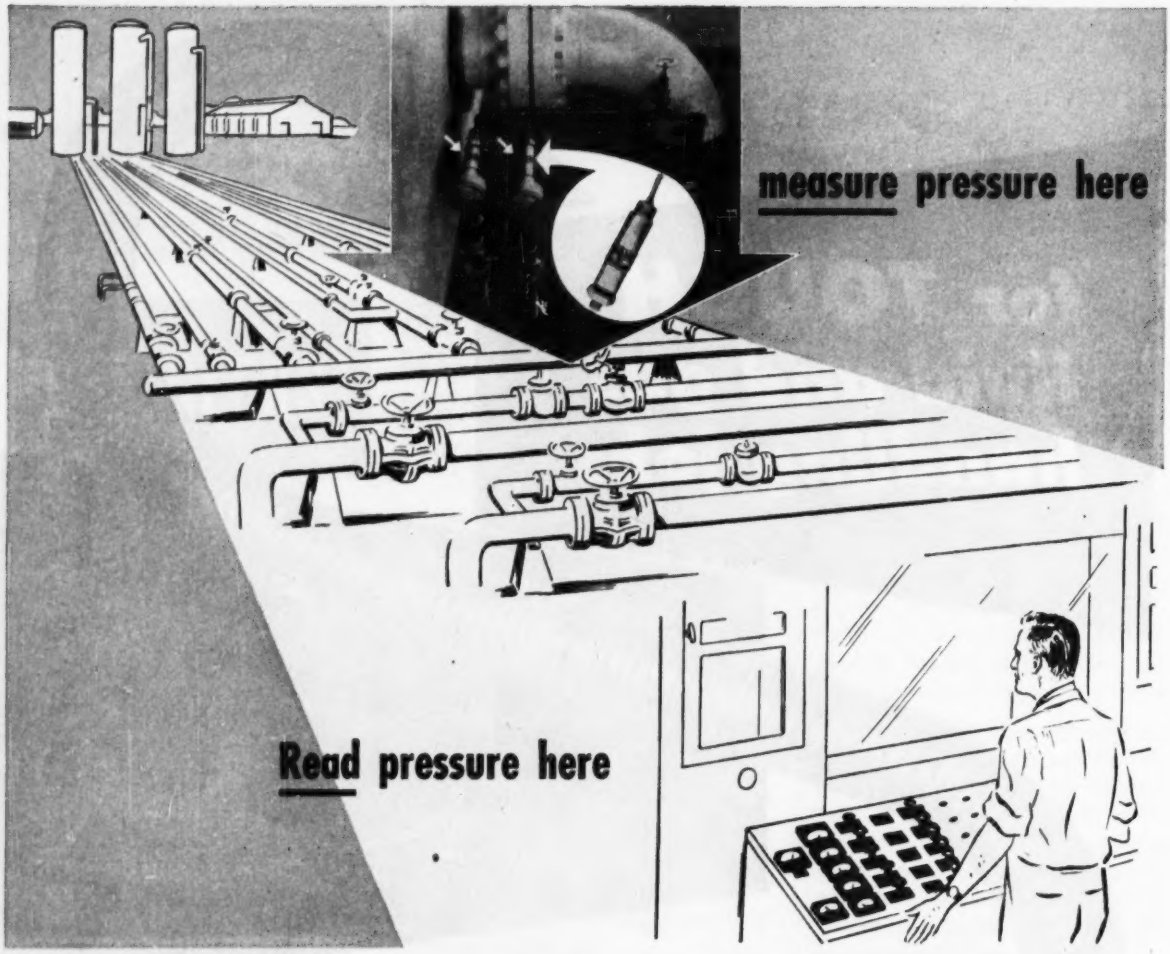
Our engineers have developed flexible metal hose for a number of classified nuclear applications. Though these types cannot be released at present, the experience gained is available for any unusual problems you may have.

Write for Chemical and Process Industries Bulletin 20D.

See our Catalogs in Sweet's Files for Product Designers and Mechanical Industries.



ATLANTIC METAL HOSE CO., INC.
129 West 64th St., New York 23, N. Y.



SR-4® Devices in industry. . . uses unlimited

THE PLANTATION PIPELINE PROBLEM:
Plantation sought a method of remote pipe line pressure control which would eliminate their calibration, maintenance and fire problems.

THE BALDWIN SOLUTION:
After a year's experience with an experimental installation Plantation installed 24 completely electronic remote indicating systems incorporating nearly 200 Baldwin SR-4 pressure cells.

Plantation reports that their SR-4 Pressure Measuring systems, in operation for a year at all 12 dual line pumping stations between Baton Rouge, La. and Charlotte, N.C., have required virtually no maintenance and have greatly reduced personnel required for maintenance of equipment and calibration of instruments. There are five reasons why the SR-4 system is so economical for pipe line control.

1. It is more accurate. Capacities of the cells range up to 1500 psi and the overall accuracy is 1% of full scale.

2. It remains accurate. After a full year's service the SR-4 pressure cells agreed with original factory calibrations within 0.2%.

3. By eliminating small fluid control piping containing inflammable product, the SR-4 system avoids potential fire and explosion hazards.

4. Ruggedly constructed, hermetically sealed, and with no moving parts, the SR-4 pressure cells make Plantation's sensing system virtually free of maintenance costs.

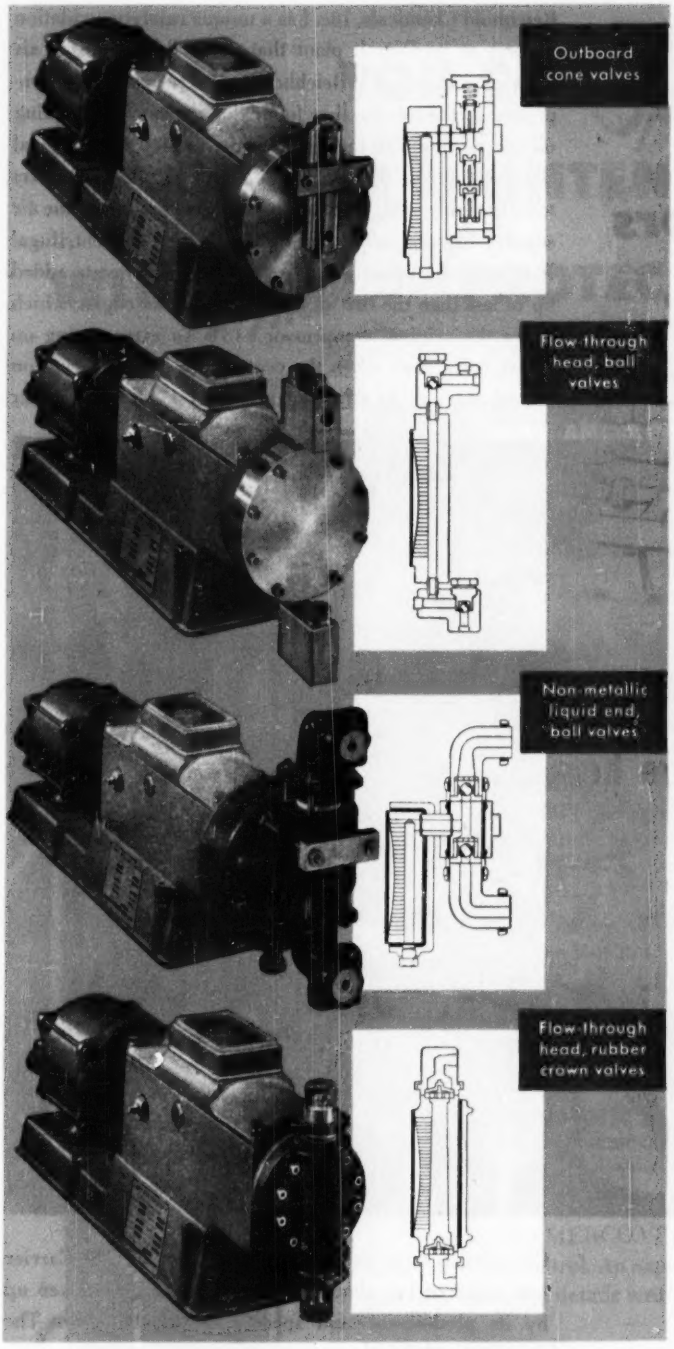
5. Highly engineered Baldwin electronic instrumentation has permanent accuracy, negligible maintenance.

It will pay you to investigate the *unlimited uses* for Baldwin SR-4 Devices. For example, in addition to pressure measurement on pipe lines, SR-4 Pressure Cells can depth gage storage tanks or measure ultra-high pressures, surges and explosion waves. For complete information about these uses as well as a multitude of SR-4 applications in measuring torque and load, *write* Dept. 3104, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

BALDWIN BLH LIMA-HAMILTON

BALDWIN-LIMA-HAMILTON

Philadelphia 42, Pa. • Offices in Principal Cities • In Canada, Peacock Bros., Ltd., Montreal, Quebec


Outboard cone valves
Flow-through head, ball valves
Non-metallic liquid end, ball valves
Flow-through head, rubber crown valves

4 VALVE CONSTRUCTIONS

TO CHOOSE FROM IN

Lapp PULSAFEEDER

PISTON-DIAPHRAGM CONTROLLED-VOLUME CHEMICAL PUMPS

No one valve design or construction is adequate to handle all types of materials which must be pumped in controlled volume. Experience indicates that flow characteristics of fluids are greatly influenced by viscosity, specific gravity, lubricity and temperature; solids in suspension require a special design, whereas low-viscosity, non-lubricating liquids present a wholly different valving problem. Lapp offers the Pulsafeeder in a variety of liquid-end designs, materials of construction, and valve assemblies—four of which are shown here. For your "special problem" in proportioned pumping of liquids, ask us for an engineering recommendation on the Pulsafeeder assembly specifically suited.

WRITE FOR BULLETIN 300 *with typical applications, flow charts, description and specifications of models of various capacities and constructions. Inquiry Data Sheet included from which we can make specific engineering recommendation for your processing requirement. Write Lapp Insulator Co., Inc., Process Equipment Div., 113 Wilson St., Le Roy, N.Y.*

POSITIVE DISPLACEMENT...AND NO STUFFING BOX!

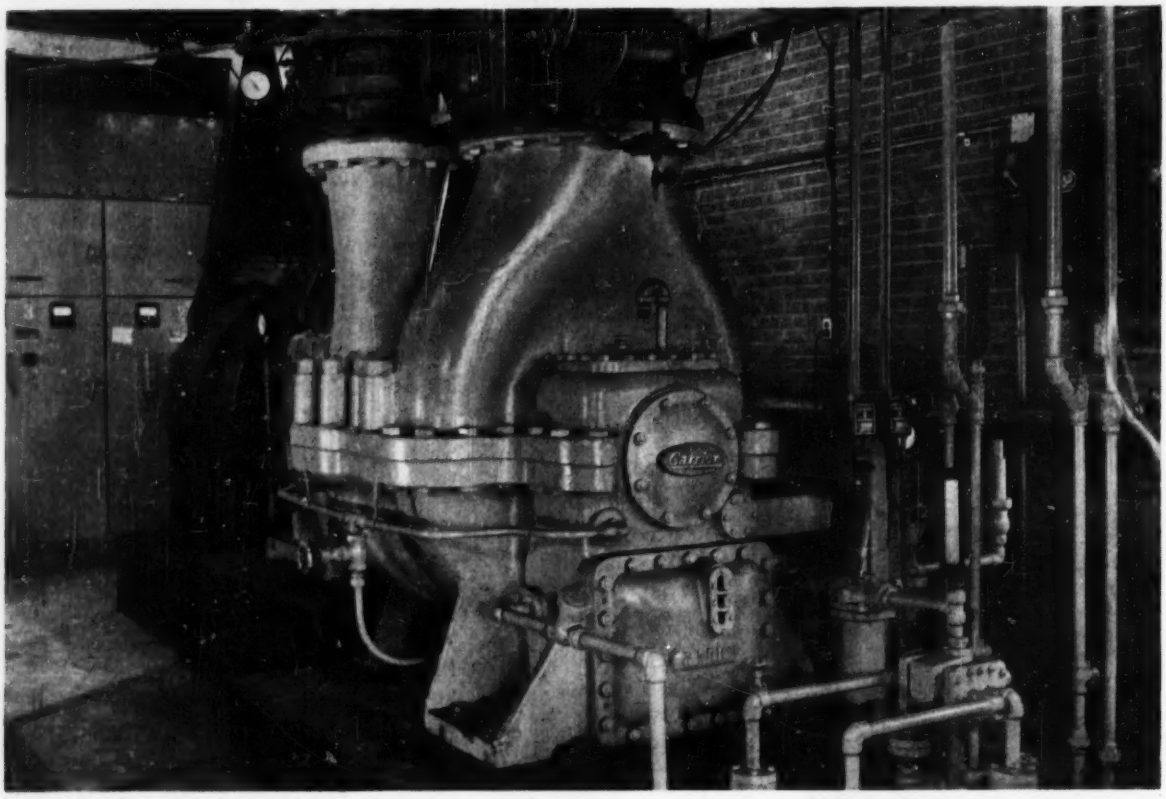
Lapp Pulsafeeder is the combination piston-diaphragm pump for controlled-volume pumping of fluids. Reciprocating piston action provides positive displacement. But the piston pumps only an hydraulic medium, working against a diaphragm. A floating, balanced partition, the diaphragm isolates chemical being pumped from working pump parts—eliminates need for stuffing box or running seal. Pumping speed is constant; variable flow results from variation in piston-stroke length—controlled by hand-wheel, or, in Auto-Pneumatic models, by instrument air pressure responding to any instrument-measurable processing variable.

Lapp

centrifugal compressors

meet the demands for an oil-free air supply

Reichhold Chemicals, Inc. has a unique catalytic oxidation process at its Detroit plant that demands an oil-free air supply. ▪ Originally, Reichhold used a reciprocating compressor on the job, but they found that too much lubricating oil was mixing with the air flow. So a Carrier Centrifugal Compressor was installed. ▪ Reichhold plant engineers tell what happened: (1) Oil no longer contaminated the air supply. (2) Operating costs were reduced—the centrifugal is driven by an electric motor and the power costs added up to less than the cost of fuel for the diesel engine which drove the original compressor. (3) An extra saving on power costs came when the centrifugal was operating on partial loads. (4) Maintenance costs were cut—Carrier



Centrifugals have but one moving part. (5) The Carrier unit required but about 25% of the floor space taken up by its predecessor—and space was valuable. (6) The Carrier Centrifugal proved its worth in an emergency. During one particular period, Reichhold was forced to operate the machine for *15 continuous months without stopping.* ▪ Is Reichhold pleased? Answer: two more Carrier Centrifugals are now working at the Detroit plant. ▪ If you need this kind of rugged, dependable performance for a continuous operation process, call on Carrier. Let Carrier engineers show you how profitably Carrier Centrifugal Compressors can do the job for you. Please call the Carrier office listed in your Classified Telephone Directory. Or write Carrier Corporation, Syracuse, N. Y.

Carrier

centrifugal compressors

refrigerating equipment

YOU CAN *Specify* MINIMUM MAINTENANCE COSTS WITH *Amercoat* PROTECTIVE COATINGS

ONLY AMERCOAT PROVIDES YOU WITH

The most complete line of corrosion resistant coatings available anywhere

Field service backed by an organization SPECIALIZING in corrosion control

The service life of your equipment—the efficiency of your production schedules – the ultimate value of your investment and maintenance dollars – all are vitally dependent on the continuing performance of the protective coatings specified in your plant. Thus, success or failure of your coatings can mean the difference between tremendous losses or substantial savings.

To assure coating performance that provides long-lasting, low-cost protection, two steps are absolute essentials, right from the start. You need the right coating for each specific exposure, and it must be applied properly if it is to yield maximum benefit.

AMERCOAT ELIMINATES THE GUESSWORK—MINIMIZES MAINTENANCE COSTS

First of all, AMERCOAT provides the right coating for the particular problem. From the complete AMERCOAT line, it is possible to provide specific coatings for specific exposures to achieve specified protective performance.

In addition, you receive the added value of AMERCOAT's conscientious service follow-through backed by an organization SPECIALIZING in industrial corrosion control. With the assistance and on-the-spot advice of a trained representative, you get the best possible application through proper attention to surface preparation and correct coating techniques.

Investigate AMERCOAT now. It's your surest way to effective, long-term corrosion control. An experienced representative is near you to serve you. For complete details write today.

Amercoat CORPORATION
4809 Firestone Blvd., South Gate, Calif.

CHICAGO, ILLINOIS
KENILWORTH, NEW JERSEY
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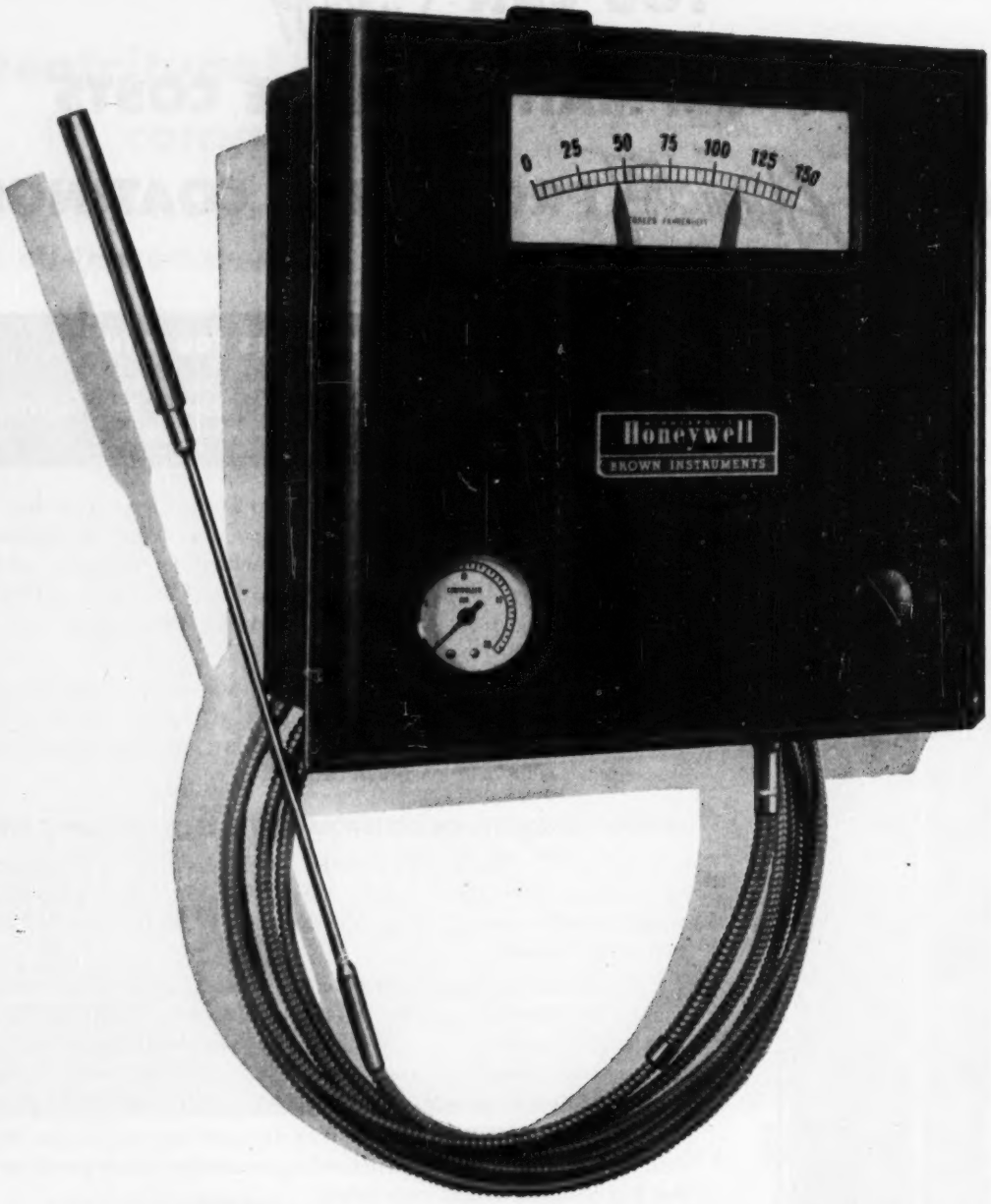


Look at these features of the Model 604P5 Thermometer Controller

GOOD READABILITY:
indicates temperature on 4½" scale.

QUICK CONTROL CHECK:
readily visible red control pointer and black indicating pointer.

CONTROL AIR CHECK:
front-mounted gauge indicates air pressure to control valve.

VARIETY OF CONTROL:
direct or reverse acting pneumatic control —either on-off or proportional action.

SELECTION OF RANGES:
23 different temperature ranges, up to 1000°F., in Fahrenheit and Centigrade calibrations, for vapor and mercury bulb systems.

COMPACT DESIGN:
die cast aluminum case 11" x 11", 4" deep; gasketed black plastic cover; practically splashproof. Interchangeable flush or surface mounting on panels of any thickness.

SIMPLE SETTING:
external knob for adjusting control point.

A new, low-cost temperature controller *from Honeywell*

MANY processes which now use manual control can utilize the advantages of automatic operation at unusually low cost—by employing the new Brown Pneumatic Thermometer Controller.

For the scores of ovens, vats, dryers and similar equipment which need only temperature indication and relatively simple control, this new instrument affords excellent control performance. It's fast, accurate . . . and simple in design. It takes so little space that it can fit readily into existing equipment or on panels.

Instrument and thermal system are complete in one package. The set point is easily adjusted by means of an external knob. The selection of control actions, ranges and types of thermometer bulbs covers literally hundreds of control applications throughout industry.

In spite of its low price, this controller is a precision-built instrument which incorporates many of the long-lasting, high-quality components used in other Honeywell products. And it's backed by Honeywell's nationwide service organization, strategically located in more than 90 principal cities of the United States and Canada.

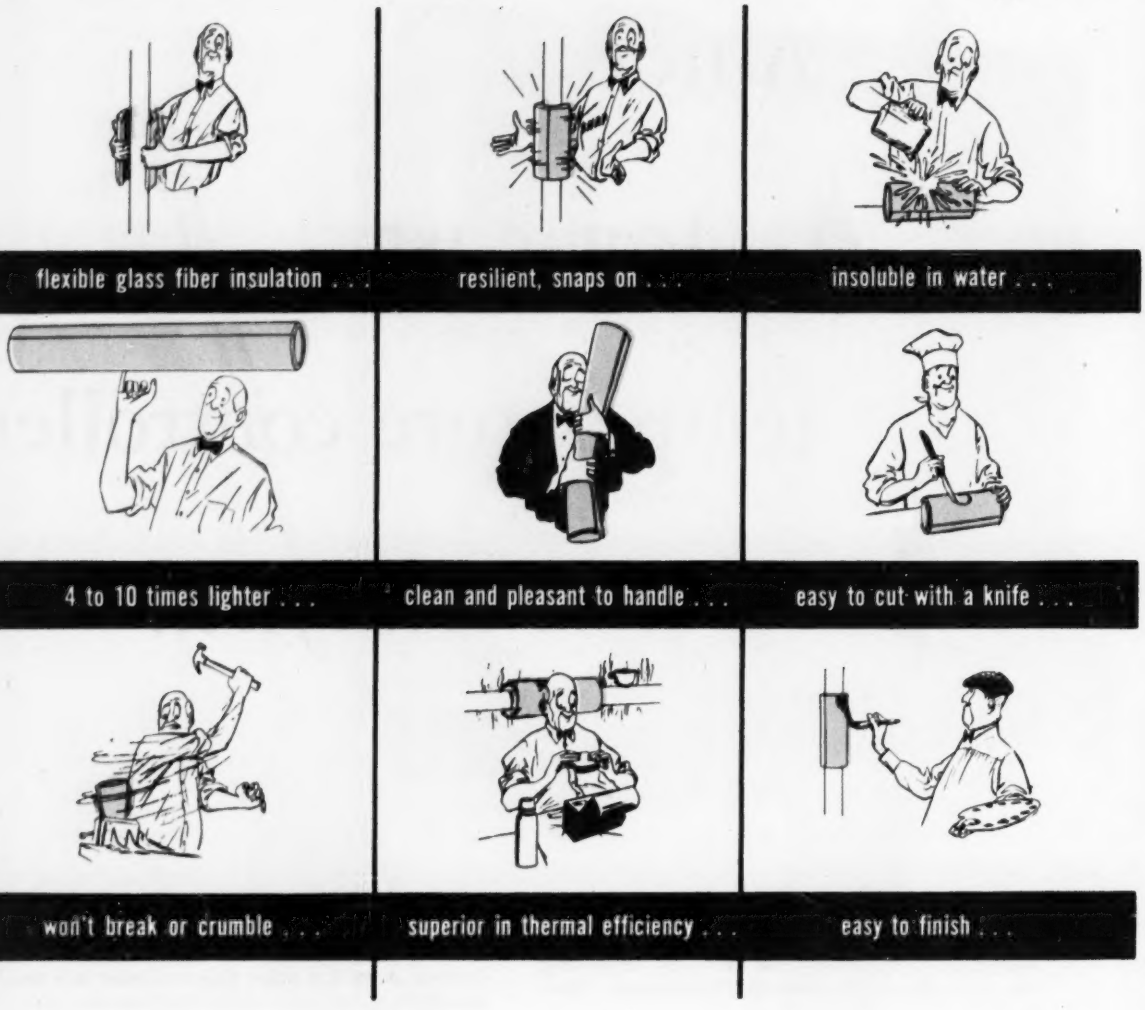
Our local sales engineer will be glad to discuss how this new controller can be applied to your own temperature problems. Call him today . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4478 Wayne Ave., Philadelphia 44, Pa.

● **REFERENCE DATA: Write for your copy of new Bulletin 6401.**

MINNEAPOLIS **Honeywell**
BROWN INSTRUMENTS
First in Controls

First ALL NEW Pipe insulation in 60 years


flexible glass fiber insulation . . .
resilient, snaps on . . .
insoluble in water . . .
4 to 10 times lighter . . .
clean and pleasant to handle . . .
easy to cut with a knife . . .
won't break or crumble . . .
superior in thermal efficiency . . .
easy to finish . . .

G-B Ultrafine pipe insulation is a new one-piece molded pipe insulation of fine glass fibers. In every sense, it is the first all-new pipe insulation since the turn of the century—ideal for hot or cold lines, for plant maintenance or new construction.

To the many advantages you see illustrated here that make it far easier to ship, stock, and apply, you can add economy. For this new pipe insulation *costs no more* than other insulations—and actual applications reflect *savings up to 50%!*

Seeing is believing. Write today and you will receive samples and complete information by return mail.

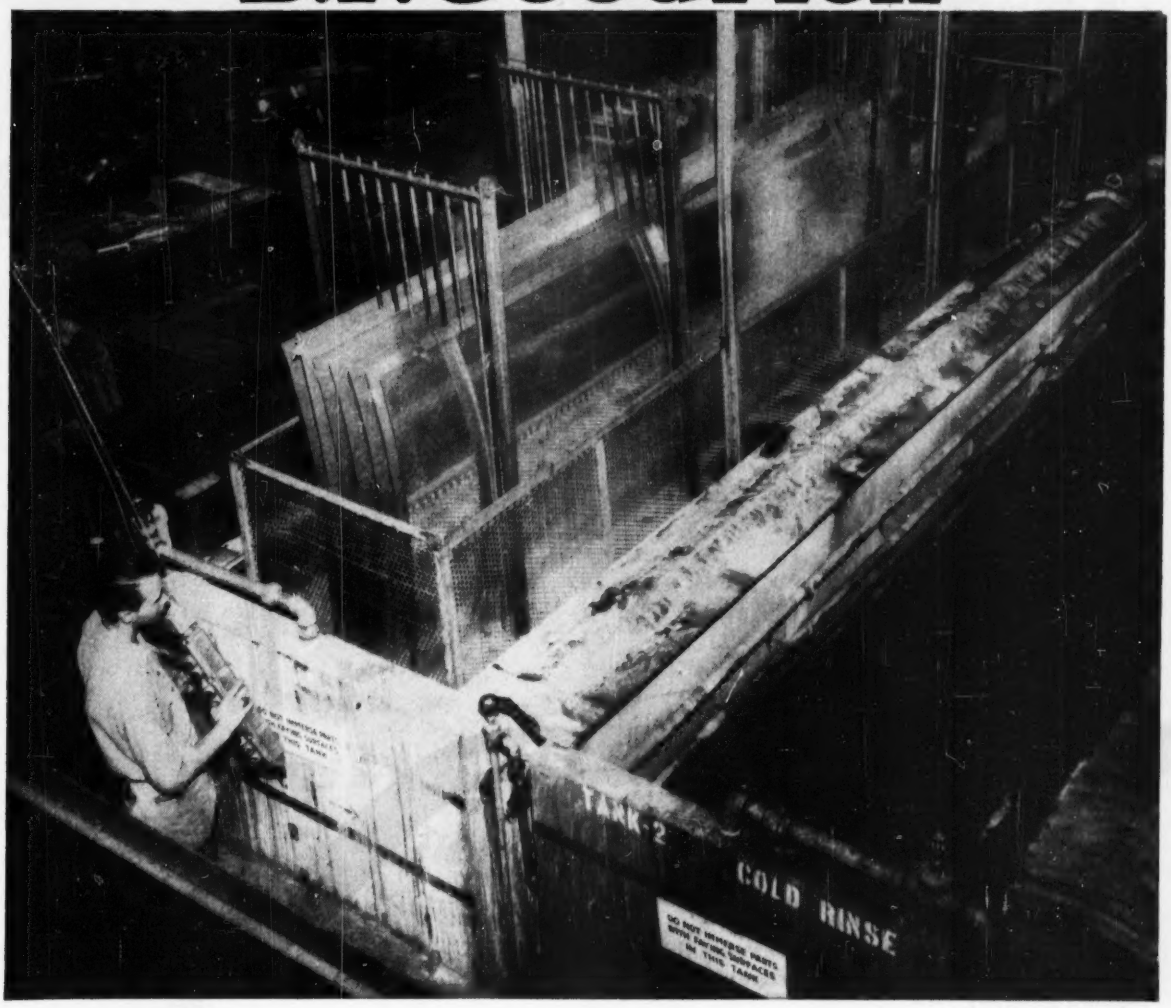
gb

GUSTIN-BACON MANUFACTURING CO.

246 W. 10TH ST., KANSAS CITY, MO.

New York • Chicago • Philadelphia • San Francisco • Los Angeles • Houston • Tulsa
Dallas • Detroit • St. Louis

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Where airplane skeletons swim in acid

A typical example of B. F. Goodrich product development

BEFORE the wings and body of an airplane can be covered, the frame must be cleaned of the slightest speck. Big tanks like these were used, filled with acids that ate off scale and got the parts ready to be painted.

A faster process was developed but it had to use acids so strong that they would eat through wood and metal tanks. In fact, not even rubber tank linings could stand up against these acids.

An engineer thought of Koroseal, the material developed by B. F. Goodrich that stands practically all acids. It was tried and worked perfectly—the two tanks in the picture are already lined with it. Koroseal made the new process possible, speeding up this vital step in airplane making as much as 50%.

Koroseal flexible material is but one example of the product development and improvement that is always going on at B. F. Goodrich. Every product that B. F. Goodrich makes—V belts, conveyor belts, hose and many other things—is constantly being studied by practical engineers to see how it can be improved from the user's standpoint, how it can be made to last longer and do a better job.

The tanks in the picture were lined by The Barber-Webb Company for Lockheed Aircraft Corp.

To take full advantage of B. F. Goodrich practical research, call your BFG distributor, or write to *The B. F. Goodrich Company, Dept. M-136, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

TAKE NO CHANCES WITH SLIGHT LEAKAGE

APPLICATION: Where even slight leakage of a flowing medium might become obnoxious, dangerous or excessively expensive.

Specify

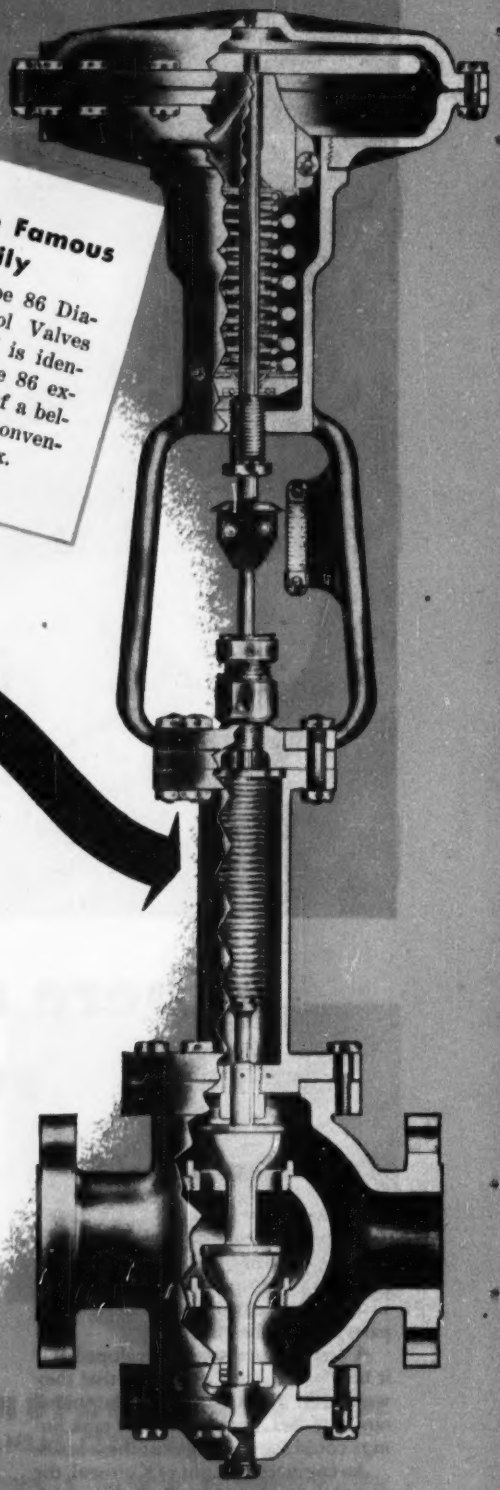
BS&B CLIMAX

Type 87 Diaphragm Control Valves

From The Famous Family

of Climax Type 86 Diaphragm Control Valves ... the Type 87 is identical to the Type 86 except for the use of a bellows seal plus a conventional stuffing box.

... with bellows sealed stem



Climax Type 87 Diaphragm Control Valves were especially developed by BS&B for the oil, gas and chemical processing industries to provide a valve which is absolutely leak-proof. All Type 87 valve bodies are designed to conform to I. S. A. tentative face-to-face standards. Design features BS&B's interchangeability-of-parts advantage for greater operating and maintenance economy.

Type 87 is manufactured for all services and in all materials that are contemplated by Type 86, and in sizes from ½" to 6". Bellows can be supplied in bronze, stainless steel, Monel, Hastelloy "B", Nickel or other special alloys suitable. Maximum working pressure 400 lbs. cwp. The conventional teflon packed stuffing box is installed at the point the valve stem passes out of the bellows casing to forestall any appreciable loss of flowing medium in case of a bellows failure.

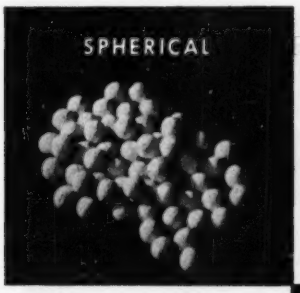
ASK YOUR BS&B MAN OR SALES REPRESENTATIVE ... or write to Black, Sivalls & Bryson, a leader for over 60 years in oil and gas producing and refining equipment ... manufacturer of the finest in controls and equipment for the processing industries ... 54 Branches and Sales Offices in the United States and Canada.

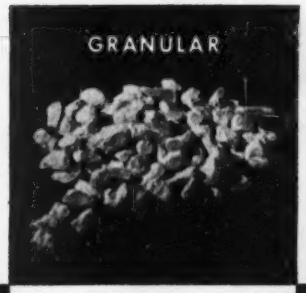
CLIMAX BS&B CONTROLS OVER 60 YEARS

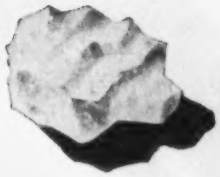
BLACK, SIVALLS & BRYSON, INC.

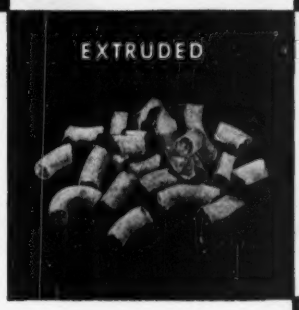
Climax Controls Division, Dept. 4-NI

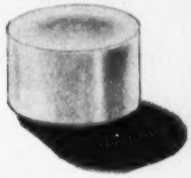
7500 East 12th St. Kansas City 26, Missouri











HARSHAW preformed CATALYSTS

specified by YOU...made by US!

Harshaw manufactures to specification dozens of catalysts for many different and complex manufacturing processes. The experience of more than fifteen years in helping to solve a great number of individual catalyst problems places us in a most helpful position, either in the development of the best and most economical catalyst, or in qualifying with large production capacity requirements. If you have a problem, perhaps a discussion with us will prove helpful.

SEND FOR *this 8-page booklet on Harshaw Catalysts*

PROCESS

Hydroforming	Cyclization	Oxidation
Dehydrogenation	Dehydration	Desulphurization
Alkylation	Isomerization	Hydrogenation

TYPICAL CATALYSTS

Aluminum Chloride Anhydrous — Boron Fluoride Addition Compounds
Boron Trifluoride — Hydrofluoric Acid Anhydrous

Alumina — Chrome Alumina — Molybdena Alumina — Tungsten Alumina
Cobalt — Copper — Magnesia — Mercury — Nickel — Vanadium

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

SALES BRANCHES: Chicago 10, Illinois, 505 North LaSalle St. • Cincinnati 13, Ohio, 6265 Wiehe Rd. • Detroit 28, Michigan, 9240 Hubbell Ave. Houston 11, Texas, 6622 Supply Row • Los Angeles 22, California, 3237 S. Garfield Ave. • New York 17, N. Y., 420 Lexington Ave. Philadelphia 48, Pennsylvania, Jackson & Swanson Sts. • Pittsburgh 22, Pennsylvania, 505 Bessemer Bldg., 6th & Duquesne Way

to date ... there are 30!

Here you see a giant absorber tower of special alloy—just one of Graver's expert fabrications at Tuscola, Illinois. Already there are more than 30 Graver-built structures, including both vessels and tankage, that operate as part of this great, new multi-million dollar installation of National Petro-Chemicals Corporation.

These Graver fabrications reflect traditional Graver skill and craftsmanship. Their high quality and guaranteed performance are essential to the successful extraction of chemicals from natural gas ...in this, the largest operation of its kind in the world.

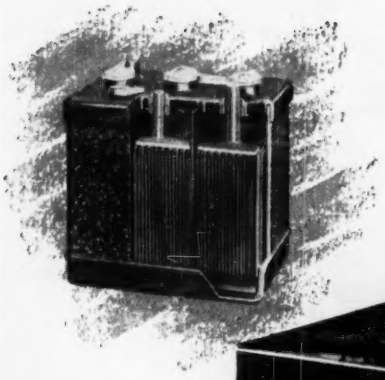
GRAVER TANK & MFG. CO., INC.

East Chicago, Indiana

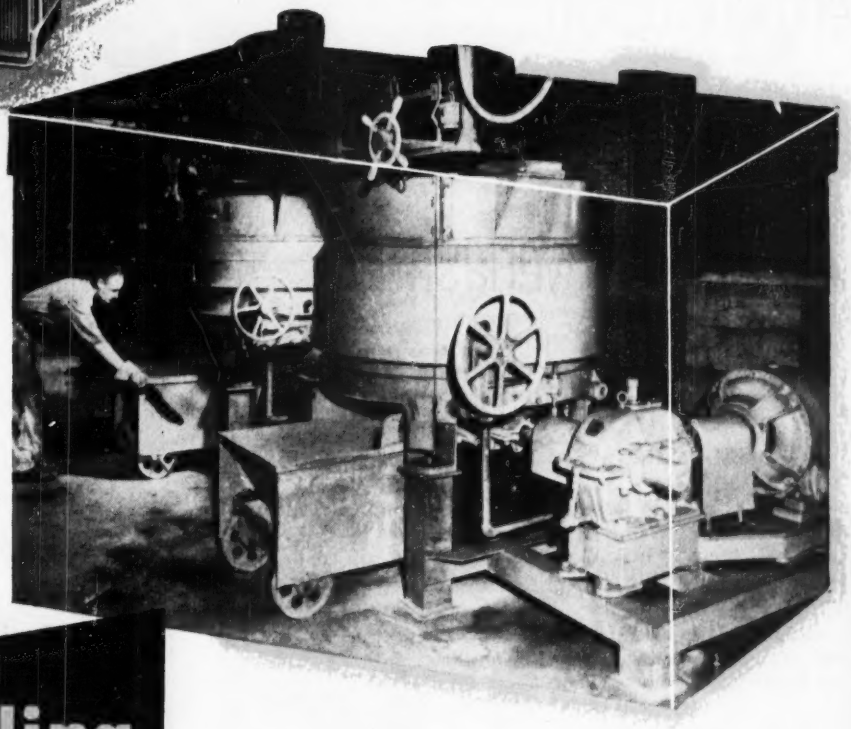
New York • Chicago • Philadelphia • Atlanta • Detroit • Cleveland
Pittsburgh • Houston • Catasauqua, Pa. • Sand Springs, Okla.
Casper, Wyo. • Odessa, Texas • Los Angeles

GRAVER

Process Vessels



in preparing
STORAGE BATTERY PASTES



mulling makes the difference!

Have increased production needs reduced your raw material mileage . . . affected your control over quality? A careful appraisal of your mixing facilities may save you money, show you where a good mixer can take the place of extensive revisions to your pasting operations. Long mixing cycles, separate cooling facilities, "hot spots" of trace ingredients mean a poor mix, lost production.

Simpson Mix-Mullers provide an intensive, kneading smearing action. Oxides, acids and water are thoroughly *blended* into one uniform mass. The entire process—mixing, reaction and cooling to pasting temperature—is accomplished *in the mixer*. Quality control is centralized—no special construction is required.

Available in 13 models, in capacities from 1/10 to 60 cu. ft., there is a Simpson Mix-Muller for your needs. Mixing is our business, our only business for over 35 years. Can we show you how MULLING can improve *your* business?

SIMPSON *MIX-MULLER*® DIVISION

NATIONAL ENGINEERING CO., 636 Machinery Hall Bldg., Chicago 6, Ill.
(Not Inc.)

end corrosion troubles with HARPER everlasting fastenings

Will the fastenings you use last the life of all equipment you manufacture?

Are they selected to defy the ravages of severe weather—salt spray—corrosive acids—destructive electrolysis?

Many manufacturers have found the small additional cost of Harper Fastenings is more than offset by the better service they render—by the prevention of equipment failure—by the improved satisfaction of customers.

Harper specializes in Everlasting Fastenings of all corrosion-resistant metals. More than 7,000 different items are carried in stock. Harper metallurgists and engineers stand ready to assist you in the development of special fastenings ——to solve production problems——to assure product improvement.

Standardize on Harper—secure these advantages: one order to write, one account to keep, one bill to pay. Call the Harper Branch Office or Distributor in your area.

THE H. M. HARPER COMPANY
8206 Lehigh Avenue, Morton Grove, Illinois

SPECIALISTS IN ALL
CORROSION-RESISTANT FASTENINGS

HARPER

EVERLASTING FASTENINGS

BRASS • NAVAL BRONZE • SILICON BRONZE • MONEL • ALUMINUM • ALL STAINLESS STEELS

· Davison Bulletin ·

DRY AIR and GAS AVAILABLE

You can have dry air in your control instruments or buildings where operations require low humidity. Dynamic adsorption can accomplish this efficiently, economically by forcing air or gas-air mixtures containing moisture through a layer or bed of chemically inert non-deliquescent silica gel. The adsorptive quality of silica gel removes the moisture making dry air available to meet your requirements. Today telephone cable producers, confectionary suppliers, libraries, ship cargo holds, etc., are dependent upon silica gel dry air systems. Many industrial gases such as nitrogen, oxygen, methane, hydrogen, bromine, chlorine, etc. are efficiently dried with silica gel.

KEEP IT DRY!

LIQUID DEHYDRATION

The presence of moisture in a liquid is often a source of operating difficulty in its application or a deterrent in the sale of the liquid. Davison silica gel offers an efficient means of moisture removal from practically all types of liquids, including dielectric oils, waxes, kerosene, benzene, toulene, methyl chloride, Freons, Genetrons and other halogenated hydrocarbons.

For help with your drying problem see your Davison Field Service Engineer or write.

FREE

Literature on Syloid® AL-1 (prevents pressure build-up in metallic paints) and Syloid® 162 (alkyd-urea flatting agent for synthetic finishes). Mail coupon for literature giving chemical and physical properties, use data, etc.

Progress Through Chemistry

THE DAVISON CHEMICAL CORPORATION

Baltimore 3, Maryland

Producers of: Catalysts, Inorganic Acids, Superphosphates, Phosphate Rock, Silica Gels and Silicofluorides. Sole Producers of DAVCO® Granulated Fertilizers.

Please send me information on

- ☐ Liquid Dehydration
- ☐ Syloid AL-1
- ☐ Syloid 162

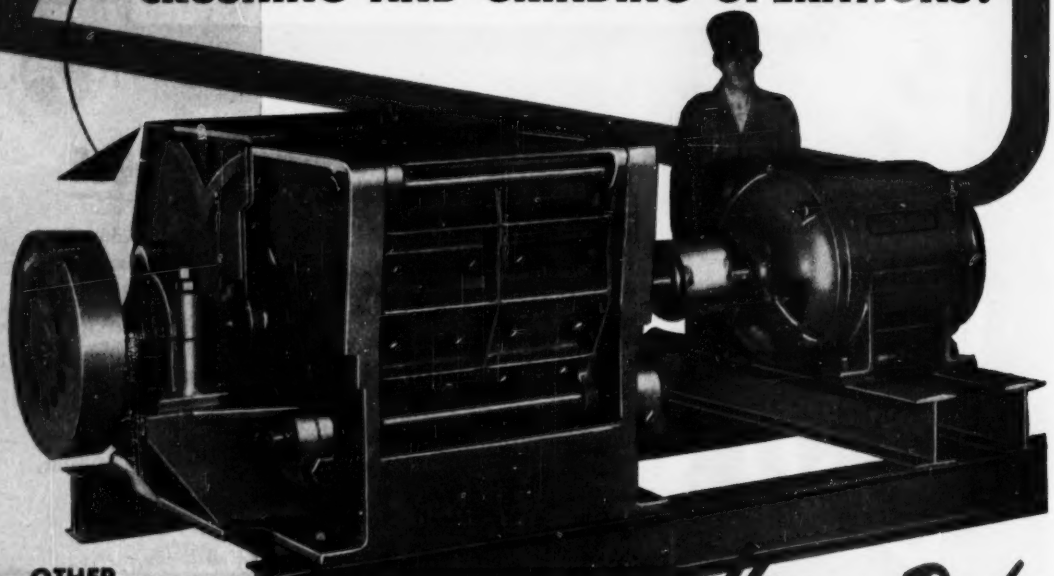
Name ..... Title .....

Company .....

Street ..... Zone .... State .....

City .....

LOWER YOUR COST— INCREASE YOUR PRODUCTION IN CRUSHING AND GRINDING OPERATIONS!



WILLIAMS *Heavy Duty* HAMMER MILLS

With a Williams, you don't need a primary crusher and another two or more secondary grinders—because *a single Williams Hammer Mill does the complete job in one operation!*

That means no additional machines are necessary—no extra foundations, housing, conveyors, drives or other equipment—*a saving up to 75% on initial investment!* And because a Williams does the job faster and better, you can *cut your crushing costs up to 50%!*

There's a Williams to suit *your* specific need, no matter what it is! It will pay you to *get the facts now!*

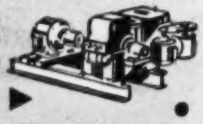
OTHER WILLIAMS EQUIPMENT

ROLLER MILLS
—IMPACT and DRYER MILLS
—for fine grinding to 400 mesh or micron sizes

AIR SEPARATORS
— any type; for precision control and high production in fine grinding

VIBRATING SCREENS
— in any size for any job. 1 to 3 decks, open or enclosed.

HELIX-SEAL MILLS
— for dust-free grinding, and for wet, sticky, greasy materials.



Also: COMPLETE "Packaged" PLANTS for crushing, grinding, separating.

AT YOUR SERVICE WITHOUT COST— WILLIAMS TESTING LABORATORY

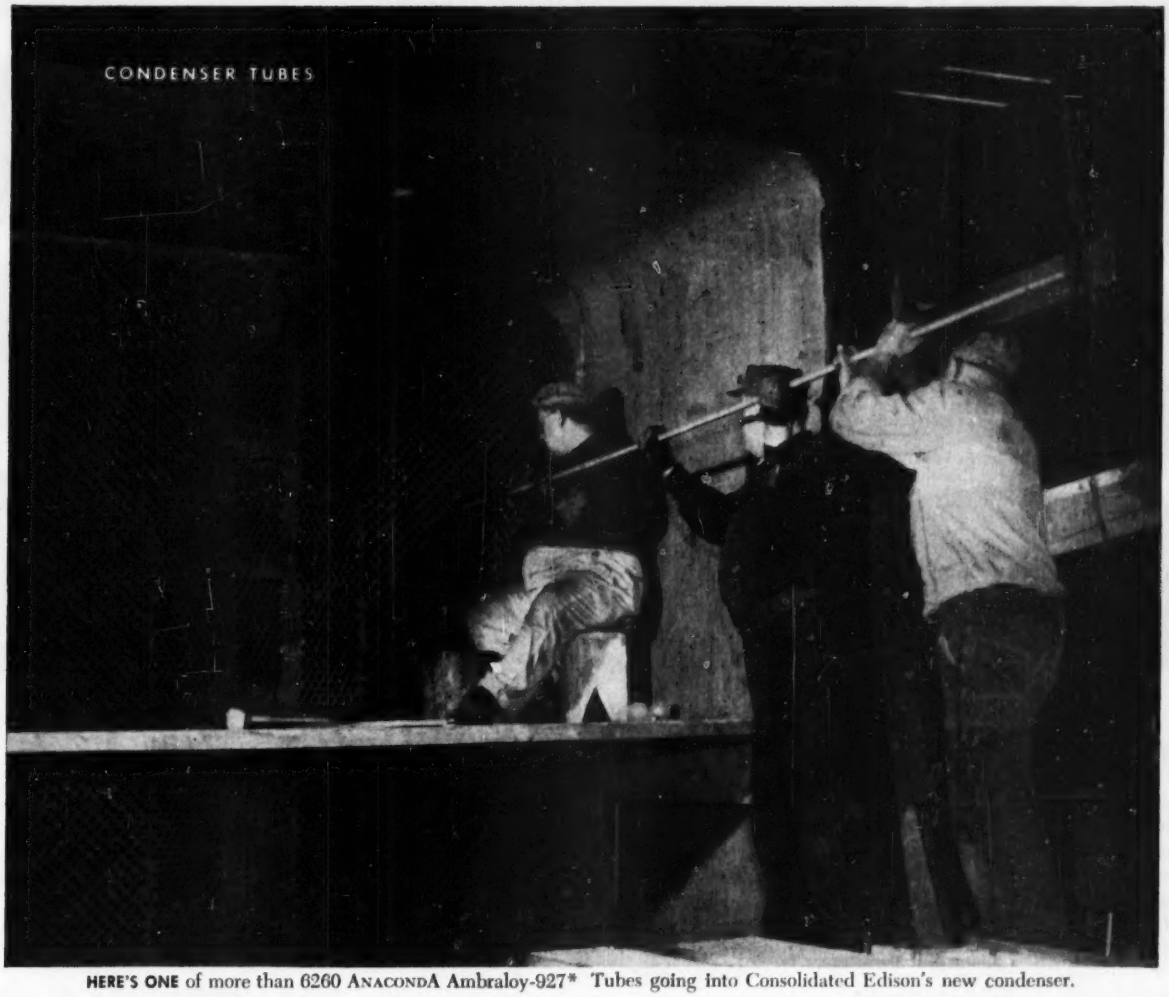
Whatever your material or product, Williams will help you solve your grinding, crushing or shredding problems without charge or obligation. Just bring or send a sample of your raw material and describe the results you want. Williams Equipment is now being used for the reduction, sizing and separation of virtually every type of chemical, mineral, vegetable or animal matter with greater speed and economy.

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.
2707 North Broadway St. Louis 6, Mo.

WILLIAMS

CRUSHERS GRINDERS SHREDDERS

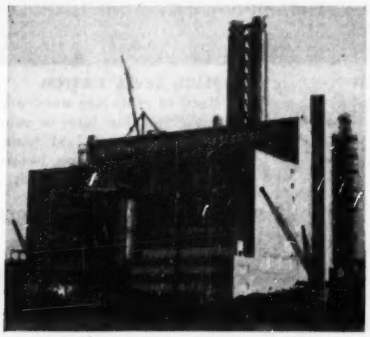
OLDEST AND LARGEST MANUFACTURER OF HAMMER MILLS IN THE WORLD



HERE'S ONE of more than 6260 ANACONDA Ambraloy-927* Tubes going into Consolidated Edison's new condenser.

Con Edison chooses Aluminum Brass for condenser tubes in new power plant

The Consolidated Edison Company's new power plant in Astoria, N. Y., will house 6 generating units. Unit #2, having a 160,000-kw generator, will be put on the line in the Spring of 1954. The condenser serving this unit has cooling surface area of 105,000 sq. ft. Tubes—15,450 of them—are Aluminum Brass, ¾" O.D., #18BWG, 30 ft. long. About half were supplied by Anaconda.



LOCATED IN ASTORIA, QUEENS, on the East River, Con Edison's new plant will mean better-than-ever electrical service for New York City.

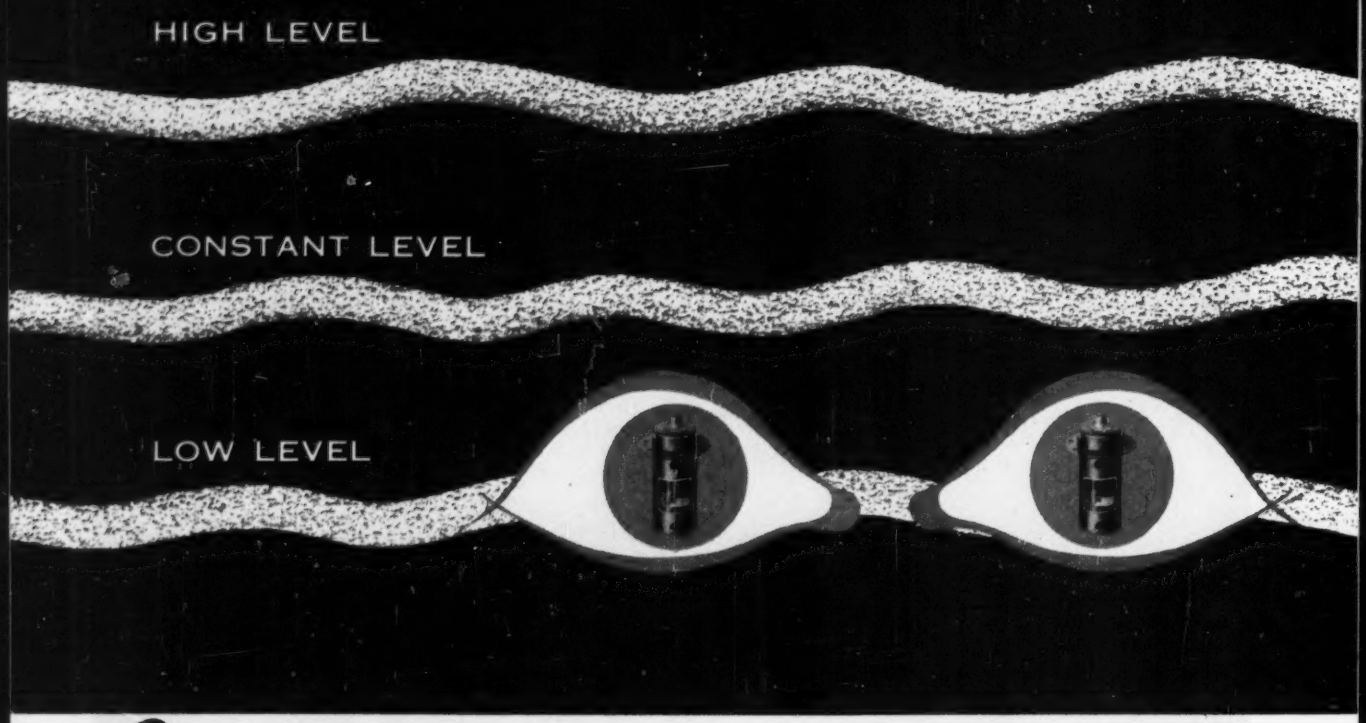
ANACONDA Ambraloy-927* (aluminum brass) is one of the most durable tube alloys available at a moderate cost. It gives excellent service in both clean and polluted sea water and has largely replaced Admiralty along the U. S. seacoast. It is used not only in main condensers, but also in auxiliary coolers for lubricating oil, transformer oil, hydrogen and air.

Anaconda supplies Con Edison — which insists upon the best equipment available — with condenser tubes and tube sheets for many of their power plants. Whatever alloy best fits *your* operating needs, choose it from the extensive line of ANACONDA Alloys for tube and tube sheets. Our Technical Department will be glad to analyze your tube performance problems at no cost. Free Publication B-2, "ANACONDA Tubes and Plates for Condensers and Heat Exchangers," will be sent on request. Write: *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.* 53112

*U.S. Patent No. 2,003,685 (ORIG.)

ANACONDA®

Tubes and plates for condensers and heat exchangers • welding rods • American Flexible Metal Hose and Tubing • American Vibration Eliminators

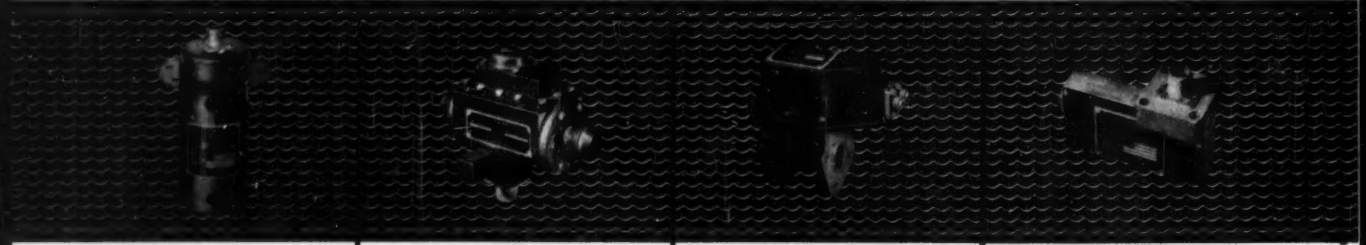


Revere INSTRUMENTS SEE WHERE YOU CAN'T

See *Revere* . . . if you need to know — **HOW MUCH LIQUID — HOW LITTLE — AT WHAT LEVEL.** *Revere's* precision made instruments are your unfailing eyes that see into sealed tanks, tubes or complex fuel lines. They can provide you with accurate measurement of liquid level regardless of pressure or temperature changes, vibration or rapid acceleration forces, AND they will automatically transmit a warning signal whenever liquid flow or level maintenance varies from a pre-determined value.

These hermetically sealed, magnetically actuated instruments employ balanced float assemblies to minimize false alarms. Compact and light, Revere instruments meet government specifications. They are available in many different configurations, some of which include relays to handle heavy electrical loads. Others are designed for complete submersion in fluids.

*Submit your control problem to our Field Engineering Department today. Revere will provide the instruments to tell you — **HOW MUCH — HOW LITTLE — AT WHAT LEVEL.** Shown below are some instruments that are the seeing-eyes of aircraft and industry.*

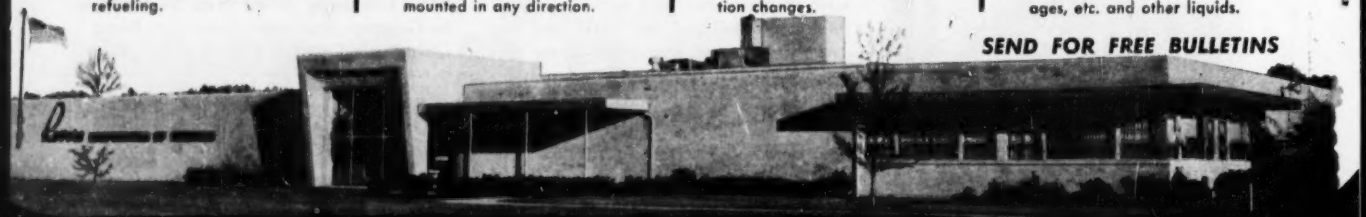


FLOAT SWITCH
Specially designed with single or dual float systems to provide automatic cut-off control for single point high pressure refueling.

FLOW SWITCH
Provides instantaneous warning signal whenever liquid flow falls below a pre-determined value. It can be mounted in any direction.

INDICATING SWITCH
Records the presence of fluid in a line whether stationary or flowing and transmits a warning signal if fluid condition changes.

FLUID LEVEL SWITCH
Used to maintain accurate high level, low level or constant level control of fuels, water-alcohol mixtures, beverages, etc. and other liquids.



SEND FOR FREE BULLETINS

REVERE CORPORATION OF AMERICA

WALLINGFORD 2, CONNECTICUT, U. S. A.

precision instruments for aircraft and industry

How to get maximum tube life per dollar: Ask the experts!

This month's report is on:

SICROMO 7

Suggested as a substitute for steels of the 5.0 per cent chromium type for applications which require increased resistance to corrosion by hot petroleum products.

ONE OF 24 TIMKEN HIGH TEMPERATURE STEELS

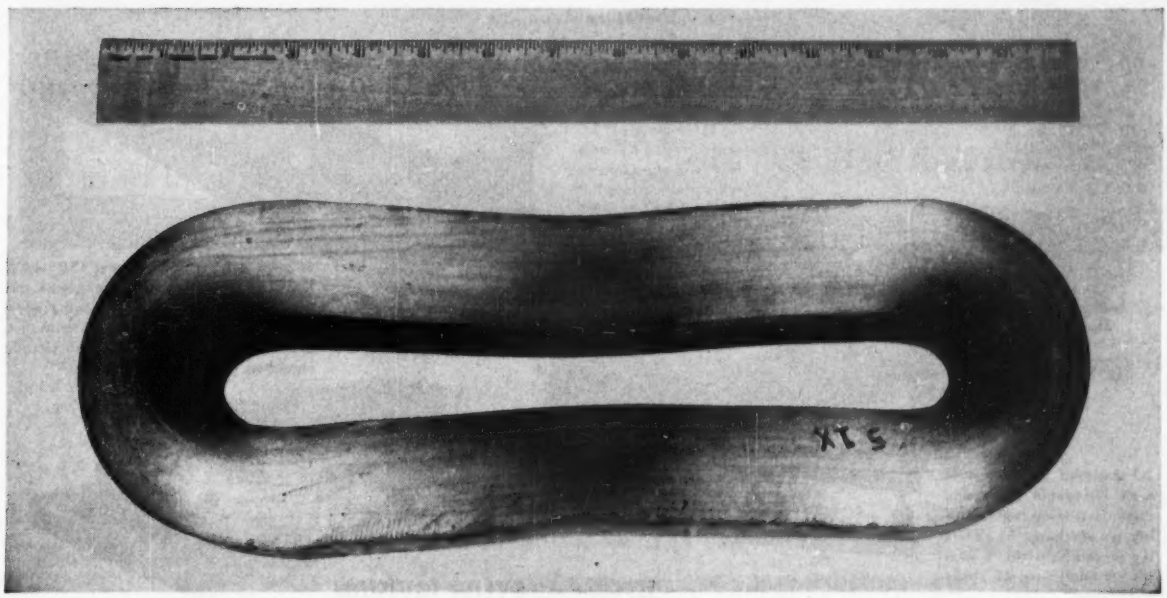
Carbon	Sicromo 2	Sicromo 5S	18-8 Ti
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	16-13-3
DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-20*
Silmo	Sicromo 3	Sicromo 9M	25-12*
DM	4-6% Cr.-Mo.	18-8 Stainless	35-15**
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	16-25-6**

** Available as seamless tubing on an experimental basis only.*
***Not available as seamless tubing.*

YOUR temperature, pressure, corrosion and oxidation problems may be solved by serveral analyses of high temperature steels. But from the standpoint of maximum tube life per dollar—the best life/cost ratio—there's only *one* analysis that's best for you.

To get that one analysis, go to metallurgists of The Timken Roller Bearing Company. They're recognized authorities on high temperature steels—with more than 20 years of steel research and experience behind them. They'll help you choose the one tube steel analysis that's best for your application from the 24 different analyses at their disposal. And no matter which one you choose, you can be assured of uniform quality because the Timken Company rigidly controls quality from melt shop through final tube inspection.

Let our "RSQ"—Research, Supply, Quality—solve your tube problems. *Ask the experts!* The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".



Flattened test of 10½" O.D. by 1.580" wall of 18-8 Cb showing the excellent ductility of large, heavy-wall Timken seamless tubing.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

No. 1-B electric vibrating Feeder—for small-capacity operations up to 3500 pounds per hour. Ideal for laboratory use.

VIBRATING EQUIPMENT

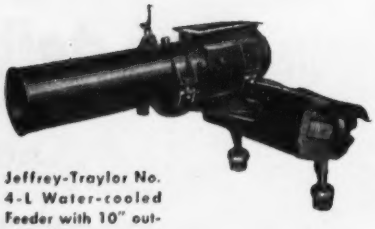
FEEDERS COOLERS
DRYERS CONVEYORS
PACKERS SCREENS

A type and size to meet requirements in continuous processing—at low over-all cost.

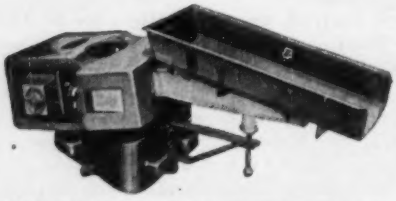
Absolute control over flow of wide variety of materials.

ULTIMATE IN FLEXIBILITY!

Literature Available

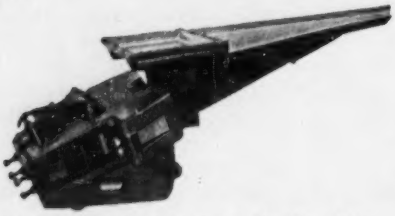


Jeffrey-Traylor No. 4-L Water-cooled Feeder with 10" outside diameter x 4' long water-jacketed deck. For feeding to high temperature furnaces or for handling extremely hot materials.



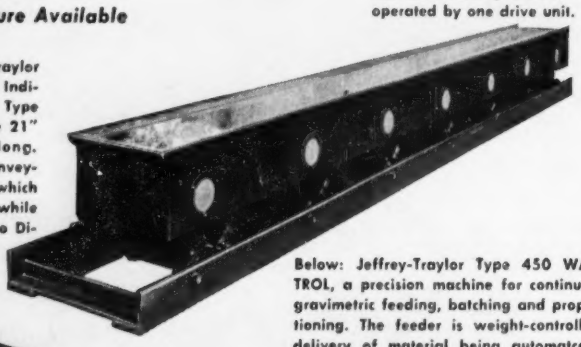
Jeffrey-Traylor No. 3 electric vibrating spark-proof Feeder with 12" x 30" open-pan deck. For feeding operations in hazardous atmospheres or under extreme moisture conditions.

M-V Mechanical Vibrating Conveyor for conveying abrasive, lumpy or rough materials, hot or cold, dry or wet, as well as fine materials. Up to 80' can be operated by one drive unit.

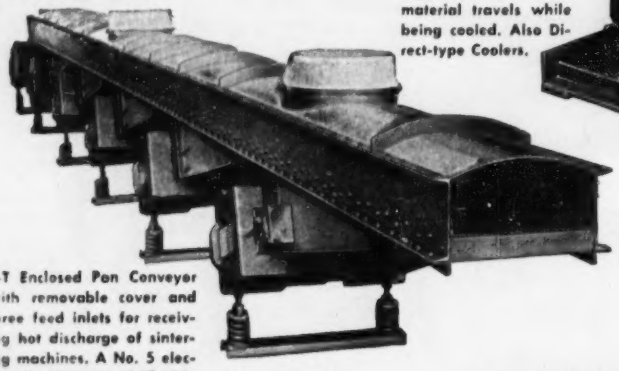


Jeffrey-Traylor electric vibrating Spreader Feeder, 14" wide x 70" long with one edge tapered to spread to 55" width.

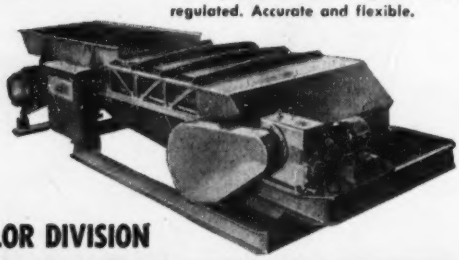
Right: Jeffrey-Traylor electric vibrating Indirect-type Cooler. Type HI-21F open type 21" wide and 18' long. Has solid plate conveying surface over which material travels while being cooled. Also Direct-type Coolers.



Below: Jeffrey-Traylor Type 450 WAY-TROL, a precision machine for continuous gravimetric feeding, batching and proportioning. The feeder is weight-controlled, delivery of material being automatcally regulated. Accurate and flexible.



J-T Enclosed Pan Conveyor with removable cover and three feed inlets for receiving hot discharge of sintering machines. A No. 5 electric vibrating type, 25" wide x 45' long.



JEFFREY-TRAYLOR DIVISION

CAPACITIES—FROM A FEW OUNCES TO TWO THOUSAND TONS PER HOUR

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

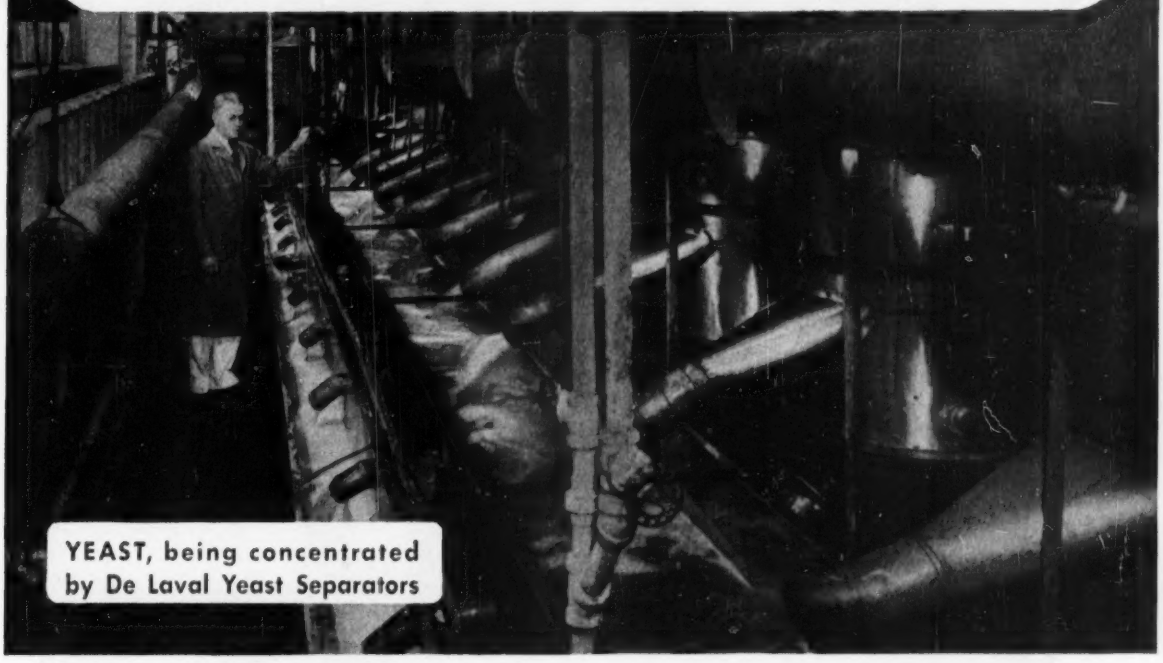
Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED
. . .IT'S A JOB FOR JEFFREY!

THE PLANT THAT LIVES 5 SECONDS IN A CENTRIFUGE



YEAST, being concentrated by De Laval Yeast Separators

De Laval Yeast Separators play an important part in the production of yeast. They centrifuge the dilute yeast slurry, removing excess liquid — and do it continuously. The Yeast Separators keep production moving without interruption.

The concentration of yeast is not a new application for centrifugal machines — in fact, it was one of the earliest instances wherein De Laval machines replaced less efficient methods of separation. But the basic fact is the same as always:

De Laval Separators and Clarifiers are the most effective means of making continuous liquid-liquid, liquid-solid and liquid-solid-liquid separations that Industry affords.

THE DE LAVAL SEPARATOR COMPANY
Chicago POUGHKEEPSIE, N.Y. San Francisco

● *You are invited to inquire.*

DE LAVAL FOR FASTER PROCESSING SYSTEMS

"DUNKED"
for your protection

Until a few years ago, if anyone had even *suggested* the use of a centrifugal compressor for over 1000 psi, the idea would have been considered absurd.

Today, pressures of not only 1000 psi, but in excess of *3000 psi*, can be safely handled by the new Clark "Barrel Type" Multi-Stage Centrifugal Compressor.

To assure complete safety to the operators, the cases of these units are hydrostatically tested by Clark at 1½ times maximum working pressure. As a final test, to detect any possible leakage when handling such hazardous gases as hydrogen, the units are pressurized with hydrogen in excess of maximum working pressure while submerged in water . . . *"Dunked" for your protection.*

Already refinery-proved, Clark "Barrel Type" Centrifugals are scheduled to be installed, in the near future, in 7 new catalytic reforming plants which will have a combined capacity of 100,000 barrels per day. They are equally well suited to many other high pressure applications, such as repressuring, ammonia synthesis and wind tunnels.

Your nearest Clark representative will give you complete details.

CLARK BROS. CO. • OLEAN, N. Y.

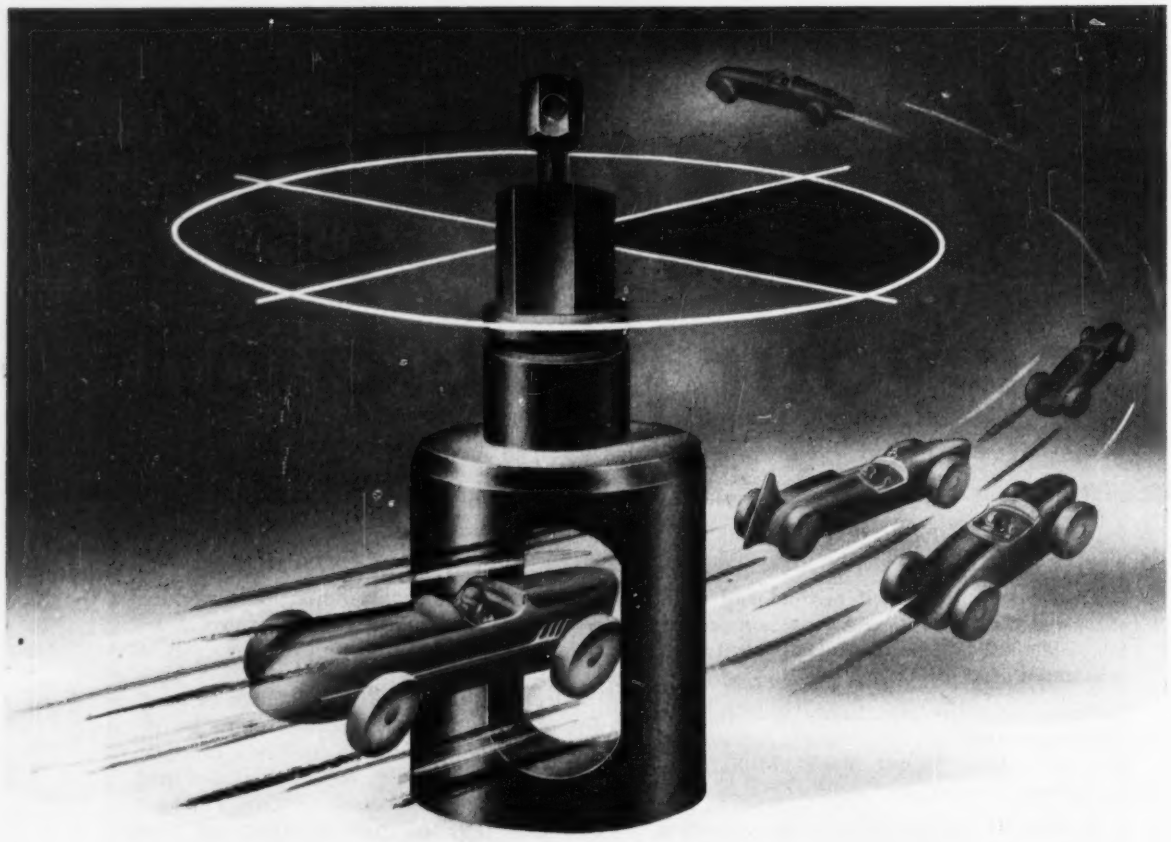
DIVISION OF DRESSER OPERATIONS, INC.

SALES OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

CLARK compressors

Clark continues to set the pace in compressor progress

© 1953, Clark Bros. Co., Division of Dresser Operations, Inc.

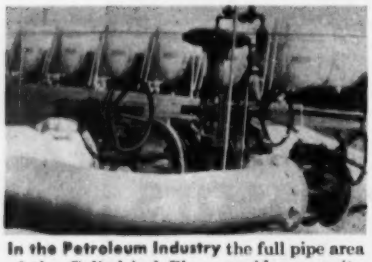


SPLIT-SECOND RESPONSE

In *valve operation, too,* fast action can often be of critical importance. A.C.F.'s CYLINDRICAL Plug has a quick quarter-turn shut-off for safe control . . . full pipe area for capacity flow . . . a non-wedging effect for trouble-free performance.

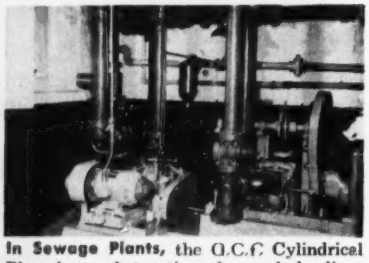
Because of this outstanding combination of features, A.C.F. CYLINDRICAL Lubricated Plug Valves are safely and efficiently handling gasoline, oil, air, gas, vacuum, acids, caustic solutions, chemicals and many other fluids.

Sealed-in lubricants cut maintenance, help insure top service at minimum cost. Specify A.C.F. Valves and be *sure.*



In the Petroleum Industry the full pipe area of the Cylindrical Plug provides capacity flow.

On Natural Gas in Steel Plants, quick shut-off and 'turn on' provides positive and immediate control of flow.



In Sewage Plants, the A.C.F. Cylindrical Plug shears obstructions, keeps sludge lines open.

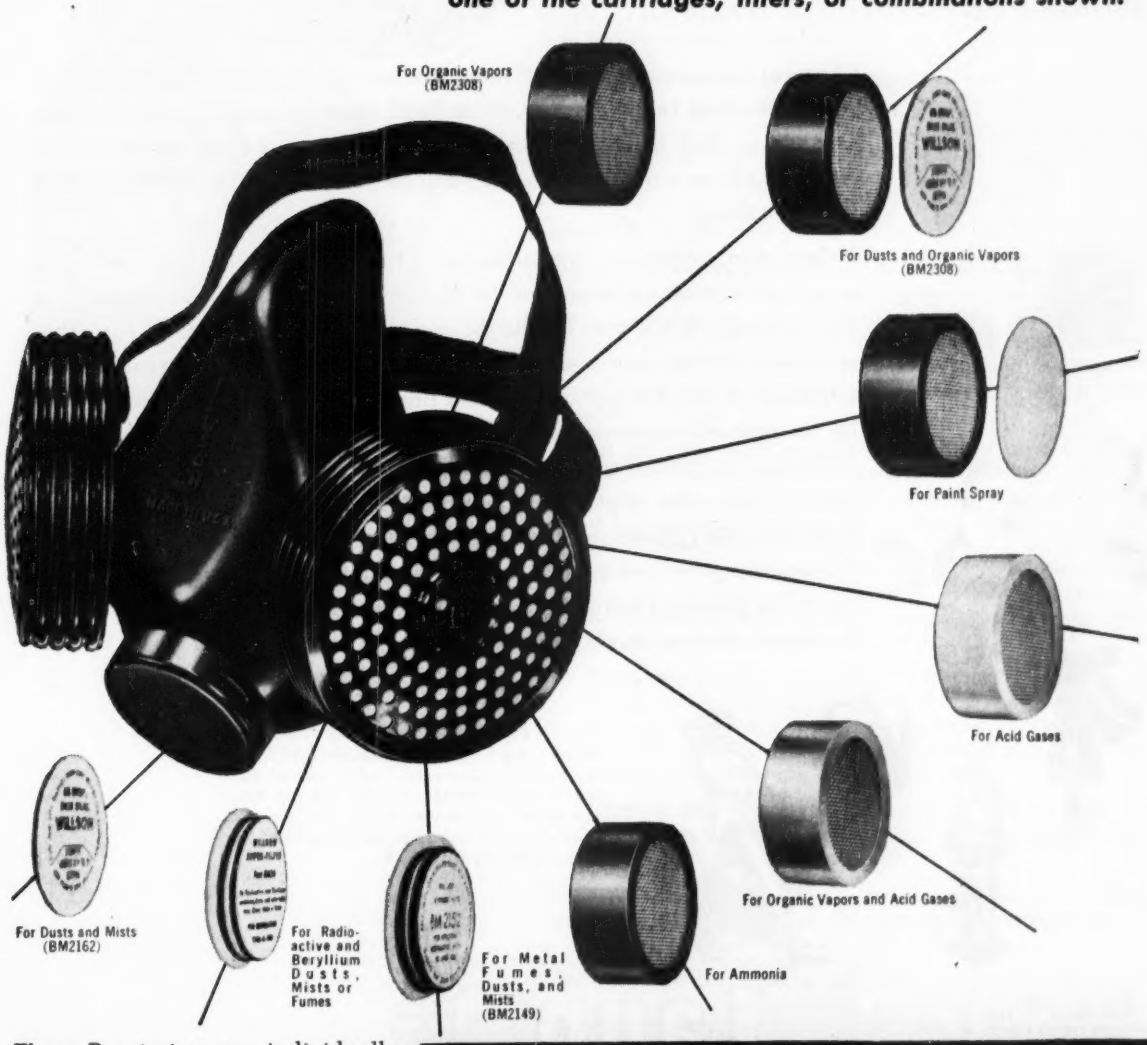
A.C.F. CYLINDRICAL FULL PIPE AREA **PLUG VALVES**

Write for Catalog 4CM. American Car and Foundry Company, Valve Division, 1501 E. Ferry Ave., Detroit 11, Michigan.

Representatives in 50 Principal Cities

NEW WILLSON Interchangeable Respirator

First truly interchangeable respirator. Requires no additional parts or accessories to use any one of the cartridges, filters, or combinations shown.


For Organic Vapors (BM2308)
For Dusts and Organic Vapors (BM2308)
For Paint Spray
For Acid Gases
For Organic Vapors and Acid Gases
For Ammonia
For Metal Fumes, Dusts, and Mists (BM2149)
For Radio-active and Beryllium Dusts, Mists or Fumes
For Dusts and Mists (BM2162)

These Respirators are individually packed in sealed, transparent plastic bags enclosed in a sturdy metal-edge box.

Write for the new bulletin fully describing these new Willson Respirators. Standardization on the new Willson No. 800 Interchangeable Respirator can greatly simplify your respiratory protective inventory.

More than 300 Safety Products Carry This Famous Trademark

WILLSON®

Established 1870

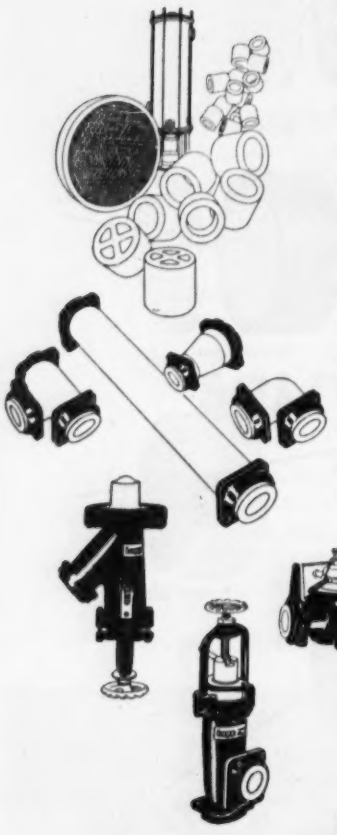
See your Willson Distributor or write for Catalog • **WILLSON PRODUCTS, INC., 106 THORN STREET, READING, PA.**

Nothing defies corrosion like

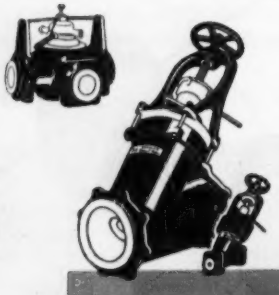
PORCELAIN

Chemical inertness to acids of all concentrations is a characteristic of porcelain. And, as made by Lapp, it is pure, dense, hard, close-grained, homogeneous and *non-porous*. This means there can be no penetration of Lapp Porcelain—no crumbling from capillary pressures—no absorption of liquids to contaminate later processing.

Valves, pipe, towers, and special shapes of Lapp Chemical Porcelain are operating with almost unlimited service in hundreds of installations where "no other material would ever handle the corrosion problem." At cost figures that sets records for economy, too. For Lapp Chemical Porcelain equipment costs but a fraction of that for special alloy and lined equipment—and quickly makes up, in reduced maintenance and elimination of need for replacement, the difference in its initial cost over that of cheaper "corrosion resistant" materials. Security and safety of plant and personnel haven't been overlooked. With TUFCLAD (fiberglass-reinforced Epoxide resin armor) Lapp Chemical Porcelain is protected against accident or carelessness. It will hold operating pressures against gross leakage, even though damaged by impact, thermal shock, explosion or fire.



ANGLE AND Y-VALVES ½" TO 6"
PLUG COCKS 1", 1½", 2"
FLUSH VALVES FOR 3", 4", 5" TANK OUTLETS
PIPE AND FITTINGS ½" TO 8"
TOWERS 12", 18", 24"
RASCHIG RINGS ⅜" TO 3"
TOWER PLATES



WRITE *for Bulletin describing characteristics of Lapp Chemical Porcelain, and listing Lapp valves, plug cocks, safety valves, flush valves, pipe, fittings, towers, raschig rings and other equipment. Lapp Insulator Co., Inc., Process Equipment Division, 156 Wendell St., Le Roy, N. Y.*

Lapp
CHEMICAL
PORCELAIN

In Ammonium Sulfate Manufacture Monel is used for mother liquor tanks, scrubbers and in saturators like these being made at the Colonial Iron Works, Cleveland, Ohio. Each of these units is 30 feet high, with a 6 ft. diameter at the bottom, 9 ft. diameter at the top. ¼" Monel plate is used for the shells.

Where to post Monel

to guard against Sulfuric Acid Attack!

It takes a "command decision" to safeguard equipment against sulfuric acid corrosion.

You need to know under what conditions the attack will be made . . . and which of the materials at your command will put up the strongest defense.

If conditions are essentially reducing — if the concentration of the acid is below 80-85% at room temperature (or 12 to 15% at boiling temperature), and oxidizing compounds are absent — the chances are that Monel is the most economical alloy you can use.

Specific Examples

Organic Sulfations and Sulfonations: Monel is used in complete reactors, in linings, heating coils, agitators, pipe, fittings, and pumps. In making alkyl aryl sulfonates, Monel is widely used in neutralization, settling and evaporating equipment, to prevent corrosion and protect product purity. Sulfated oils processed in Monel equipment are normally equivalent in color to those processed in glass.

Fat Splitting and Organic Esterifications and Condensations: Monel is a standard material here to resist corrosion by the sulfuric acid commonly employed as catalyst. Solid or lined splitting tanks, for example, have shown less than .01 inches loss of metal in a year of continuous operation. Even where liquid temperatures go as high as 300° F., Monel heating coils are being used successfully. In condensing phenol-formaldehyde resins, reaction kettles, agitators, vapor lines and the condensers are all made of Monel.

Petroleum Refining: Monel tanks are used for sulfuric acid treatment and subsequent washing of lubes and light industrial oils; Monel cloth to filter clay-treated acid stocks, Monel bowls for sludge separation centrifuges and Monel rods for sludge handling pumps.

Treating Coal Distillates: Monel tanks and agitators are used in treating crude benzol, light oils, naphthalene and similar products with sulfuric acid.

Whenever you deal with dilute sulfuric acid there is an excellent chance that Monel is the best and most economical metal to use to safeguard your equipment.

If Monel won't do . . . one of the other Inco Nickel Alloys may prove to be just what you need. For further guidance contact Inco's Development and Research Division . . . and write for our 44-page Technical Bulletin T-3, "Resistance of Monel, Nickel and High Nickel Alloys to Corrosion by Sulfuric Acid."

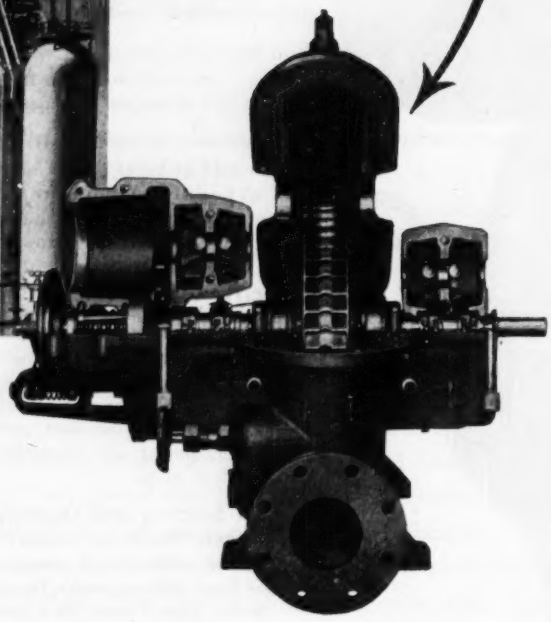
THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

Inco Nickel Alloys

INCO

Monel . . . *for minimum maintenance*

REFINERY has 101 ways to save money



When the yearly cost of replacement parts for 101 steam turbines averages *only 1.6% of the initial investment,* you are saving money . . . and plenty of it.

This amazing record was established by Terry turbines at a large refinery on the Atlantic coast. The percentage figure was determined by means of an accurate tabulation of the cost of replacement parts required over a two-year period.

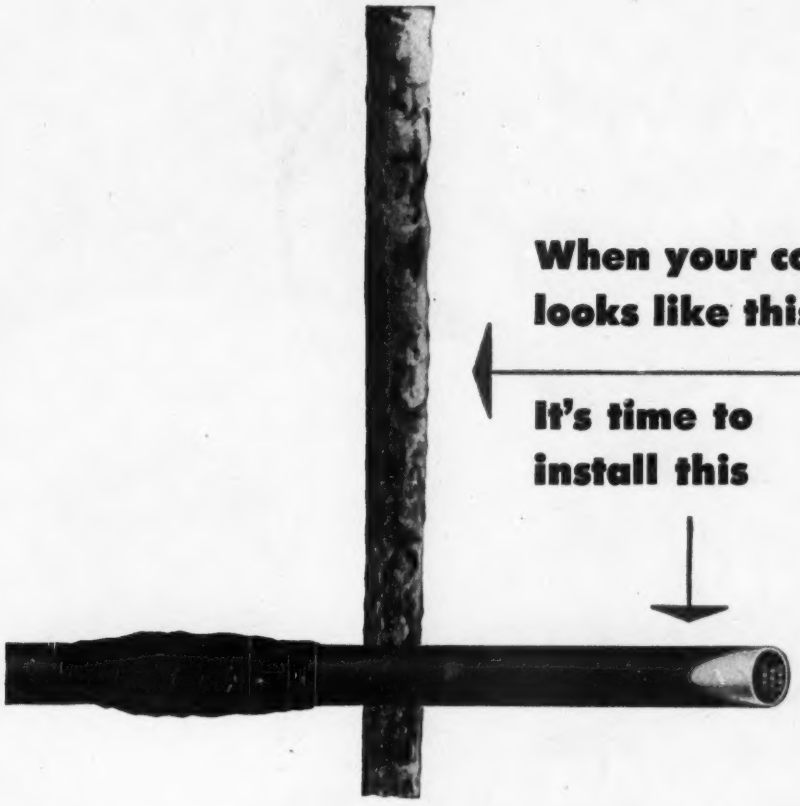
These 101 Terry machines provide a good cross section of the various types of small and medium-size turbines made by the company. Ranging in size from 10 to 1200 horsepower, they include single and multistage axial flow designs as well as the famous Terry solid-wheel turbine.

Such outstanding performance records are not at all unusual for Terry turbines. The thousands and thousands of these machines installed in refineries throughout the world provide an accurate yardstick for measuring turbine reliability.

Send for illustrated bulletins. No. S-116 describes the many advantages of the Terry solid-wheel turbine. For multi-stage turbines, ask for a copy of Bulletin S-146.

TERRY

THE TERRY STEAM TURBINE CO.
TERRY SQUARE, HARTFORD 1, CONN.



When your conduit looks like this...

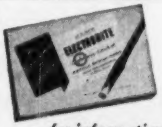
It's time to install this

Next time you have to replace electrical raceways that have been eaten up by high humidity and corrosive fumes, consider Republic ELECTRUNITE "Dekoron-Coated" E.M.T.

You'll be getting all the protection of a galvanized rigid steel raceway . . . ELECTRUNITE E.M.T. . . . plus a tough, polyethylene coating that stands up against chemical fumes and moisture. It's a plastic armor coating on steel that cuts maintenance costs and lengthens the service life of the raceway.

Installation is easy. Electricians find it easy to cut "Dekoron-Coated" E.M.T. to length, bend it to fit. Joints are protected by polyethylene or vinyl-backed electrical tape. Raceways are protected against corrosion from end to end.

Chemical resistance of ELECTRUNITE "Dekoron-Coated" E.M.T. plus information on how to install it are included in Booklet DEK-1. Write for it. Also available on Republic Rigid Steel Conduit.



WRITE FOR BOOKLET

... for information on "Dekoron-Coated" E.M.T. . . . it gives years of service where operating conditions are rough on raceways.

STEEL AND TUBES DIVISION
REPUBLIC STEEL CORPORATION
204 East 131st Street • Cleveland 8, Ohio

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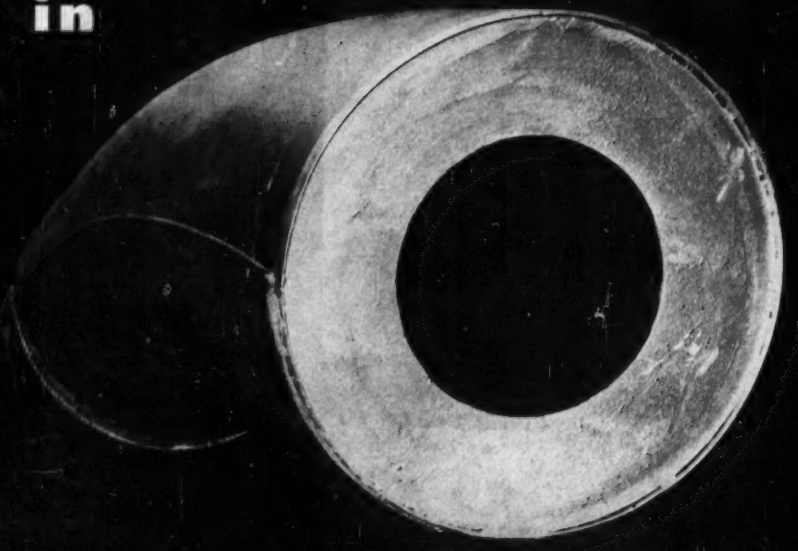
ELECTRUNITE E.M.T.

The largest pipe bends ever made in the South and Southwest

34" O.D.



TEXAS PIPE BENDING COMPANY

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WELDED HEADERS

Pipe Fabricators
HOUSTON TEXAS

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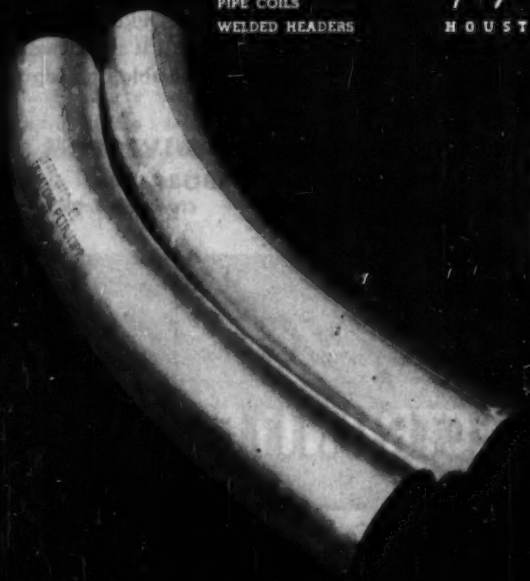
WEntworth 6605



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Ratographic* totalizer

complete with continuous rate indication

- continual integration at rate of 24 times per minute
- dust-proof drive mechanism immersed in oil
- heavy duty 100 rpm — 72 pole synchronous motor
- standard size pneumatic receiver and integrator
- front-of-panel accessibility and removal
- accuracy within 1% of full scale

Here, for the first time, is a *full-size*, rugged totalizer — so designed that it can be used in full size, miniature or graphic panels. A companion to the F & P Ratographic miniature indicator, it is another step in complete process instrumentation developed and perfected by the skilled engineers at Fischer & Porter Company.

The entire unit occupies only six inches square of panel space. In extended position, as shown, instrument continues to function, thus easily enables observation of mechanism. The highly accurate integrating unit gives the equivalent of continuous integration. The many other new features combined in this instrument suggest a careful comparison. Full information on request.

*T. M., F&P Co.

complete process instrumentation

FISCHER & PORTER CO.

620 County Line Road, Hatboro, Penna.

2241

Company owned sales and service branches strategically located throughout the world.

1943
AN AWARD
Carbide and Carbon Chemicals Corporation
1946
AN AWARD
Union Carbide & Carbon Corporation
1933
AN AWARD FOR CHEMICAL ENGINEERING ACHIEVEMENT TO CARBIDE & CARBON CHEMICALS CORPORATION
PRESENTED BY CHEMICAL & METALLURGICAL ENGINEERING
1953
AN AWARD FOR CHEMICAL ENGINEERING ACHIEVEMENT TO CARBIDE & CARBON CHEMICALS COMPANY
PRESENTED BY CHEMICAL ENGINEERING

Awards that foretell your gain

Chemicals from coal hydrogenation...
...acclaimed the 1953 Chemical Engineering Achievement!

IN 1933 Carbide received the first Chemical Engineering Achievement Award. This recognized the beginning of commercial production of much-needed chemicals from petroleum and natural gas—which proved to be the beginning of the American petrochemical industry.

HISTORY REPEATS—Now, just twenty years later, Carbide has received the 1953 Chemical Engineering Achievement Award for "the first successful production of chemicals from coal by a high pressure hydrogenation process."

In minutes, coal becomes gases and liquids rich in needed chemicals—"one of the major contributions in this century to the well-being of us all."

Some of these chemicals are used in making plastics, synthetic rubber, pharmaceuticals, vitamins, and many other things. Others are completely new and hold great promise.

FOURTH RECOGNITION—Carbide is the first two-time individual recipient of this award. It also is the fourth time the people of Carbide have been recognized, for they shared in two previous group awards—in 1943 for synthetic rubber, and in 1946 for atomic energy.

TRUE SIGNIFICANCE—As in all Chemical Engineering Achievement Awards, coal hydrogenation was recognized not as the accomplishment of any one individual but as the result of the cooperative efforts of many.

The people of Union Carbide appreciate the recognition of their achievement by the distinguished Committee of Award, composed of senior chemical engineering educators.

UNION CARBIDE
AND CARBON CORPORATION

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UCC's Trade-marked Products include

SYNTHETIC ORGANIC CHEMICALS
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UNION Carbide
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NEW

Ratographic* totalizer

complete with continuous rate indication

- continual integration at rate of 24 times per minute
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- standard size pneumatic receiver and integrator
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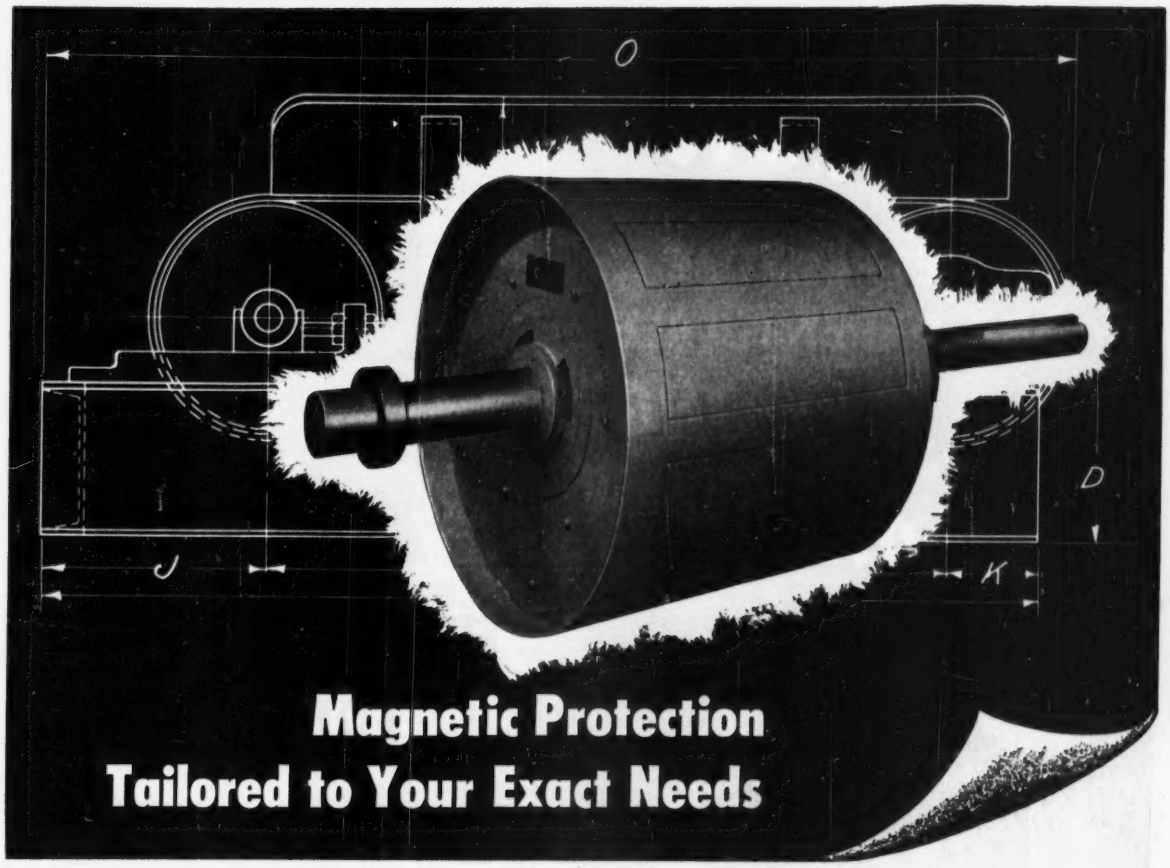
DYNEL Textile Fibers
UNION Carbide
PRESTONE Anti-Freeze
PREST-O-LITE Acetylene
LINDE Oxygen
NATIONAL Carbons
ACHESON Electrodes



Magnetic Protection Tailored to Your Exact Needs

When you specify a powerful, solidly built Stearns Permanent Magnetic Pulley for tramp iron removal, you get protection that's tailored exactly to your plant and product. Here's why:

First, Stearns magnetic specialists study every aspect of your installation . . . size of conveyor belt . . . speed of belt travel . . . size of material . . . depth of material . . . atmospheric conditions . . . available space . . . and many others. Then, Stearns interprets these factors and selects the magnetic pulley that will provide you with maximum plant protection and product purification.

Stearns offers both permanent and electro-magnet pulleys. A word from you places nearly 40 years of research and engineering experience at your disposal. Write for bulletin 350C-1.

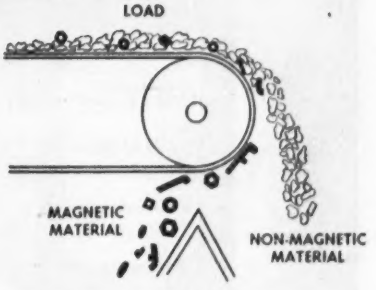


Diagram showing how Stearns magnetic pulley removes tramp iron.

Check These Advantages

- **PULLING POWER** — Design and position of Alnico magnets provide a uniform, powerful pulling force.
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FASTER

MORE EFFECTIVE... MORE DEPENDABLE

FIRE-STOPPING POWER

MODEL 20-B

ANSUL Chemical Company

FIRE EQUIPMENT DIVISION • MARINETTE, WISCONSIN

ANSUL

FIRE EXTINGUISHING EQUIPMENT

FASTER . . . A short, quick downward motion of the puncture lever pressurizes the extinguisher and it is ready for instant use.

MORE EFFECTIVE . . . Even the inexperienced operator gets near-expert results because of the ease of operation and handling. In addition ANSUL *"PLUS-FIFTY"* Dry Chemical has greater fire-killing power.

MORE DEPENDABLE . . . Exclusive ANSUL-ENGINEERED design features include water-tight and corrosion-resistant construction, easy, on-the-spot recharge without special tools and other exclusive Ansul developments which insure greater dependability.

FIRE-STOPPING POWER . . . ANSUL FIRE EXTINGUISHERS have the highest ratings for fire-stopping power ever awarded any type of class B and C fire extinguishing equipment.

Send for File No. B-202 You will receive a variety of helpful printed matter. Included is our latest catalog which describes Ansul Extinguishers of all sizes — from the small Ansul Model 4 to Ansul Piped Systems and Ansul 2000 lb. Stationary Units.

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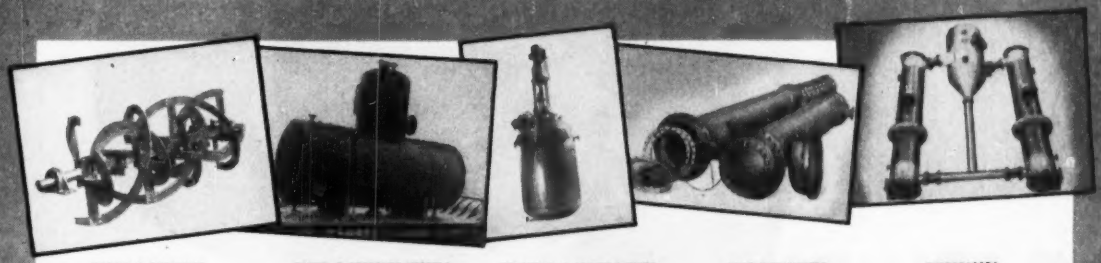
MANUFACTURERS OF
DRY CHEMICAL FIRE EXTINGUISHING EQUIPMENT, REFRIGERATION PRODUCTS, INDUSTRIAL AND FINE CHEMICALS AND LIQUEFIED GASES

Here's A **Single Source** of **Supply**

For so Many of Your Process Needs



MIXERS & AGITATORS

Types: turbine, propeller, paddle, anchor, finger, screw, ribbon, gate. Service: For all single or multi-phase processes involving liquids, solids, pastes and gases.

TANKS & PRESSURE VESSELS

Materials: carbon steel, the stainless steels, nickel, monel, inconel, hastalloy, clad steels. Construction: ASME Code

REACTORS & PROCESS UNITS

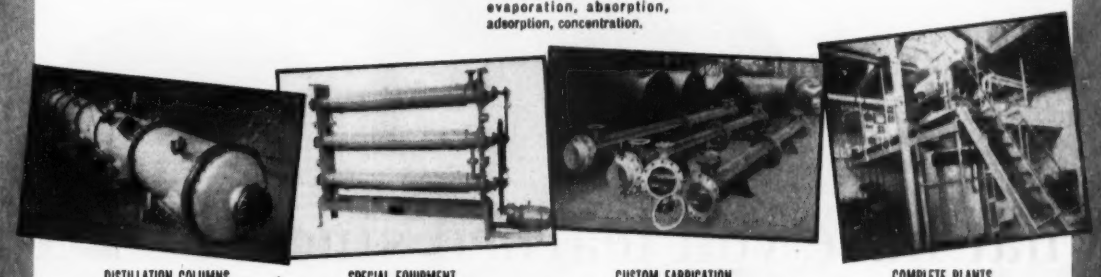
Processes: chlorination, fermentation, saponification, hydrogenation, nitration, sulfonation, polymerization, digestion, esterification, other organic syntheses. Operations: crystallization, heat transfer, extraction, drying, distillation, evaporation, absorption, adsorption, concentration.

HEAT EXCHANGERS

Types: shell and tube, floating head, fixed tube sheet, U-band key fittings.

EVAPORATORS

Types: forced circulation, natural circulation, multiple-effect.



DISTILLATION COLUMNS

Types: bubble cap, packed, "turbogrid", special types.

SPECIAL EQUIPMENT

Like chillers, crystallizers, paste mixers, cone and ribbon blenders, post mixers, vacuum pan dryers, paint reducing tanks.

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The Newark Plant of I★P★E is one of the largest and best equipped in the East. You get precision machine work and highest quality welding on everything from a simple tank to a complex mechanical unit. Facilities list available on request.

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Scope: From process and equipment design, to fabrication and construction, to initial operation.

If you're in on the purchase specifications of plants and equipment, you know well the advantages of dealing with a *single source of supply* . . . one point of responsibility, uniformity of materials, similarity of parts. Your entire plant or process unit fits together better, runs more smoothly and gives you trouble-free service.

From the fabrication of vessels, agitators or precision machinery . . . to the engineering, design and construction of process units or entire industrial chemical plants . . . . I* P* E offers you the *complete* service. Whatever your needs are, you'll get more help at lower cost from I* P* E. Write or 'phone today.

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ENGINEERS, DESIGNERS, MANUFACTURERS OF PROCESSING PLANTS AND EQUIPMENT

What have you learned since 1921?

Lots of things have happened in the last three decades, and nobody who has lived through them can have failed to acquire a great deal of valuable information and experience.

That's why it's important to you that the first LaBour self-priming centrifugal pump was sold in 1921—more than thirty years ago. The problems of those thirty years, the things we've learned the hard way about design and casting, make today's LaBour pumps more dependable, more efficient, more useful in more ways throughout the chemical industry.

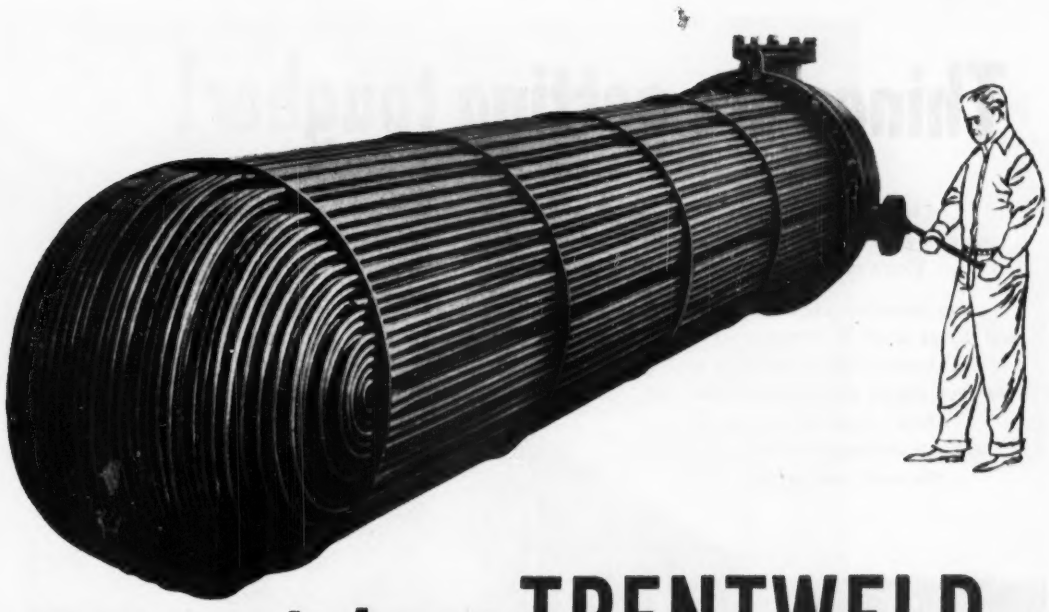
Today, of course, there are many copies and adaptations of LaBour, so far as patent laws permit. The thing that can't be copied, and for which there is no substitute, is thirty-two long years of doing the job—meeting the challenge of new demands day after day.

Because unfailing continuity of pump service is so important in process plants, LaBour dependability as proved through the years, is the wise engineer's choice. When you can't afford to take a chance, you take a LaBour.

ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

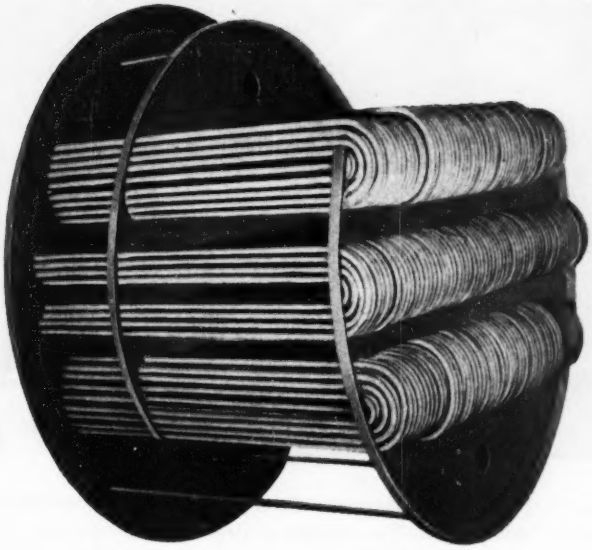
LABOUR

THE LABOUR COMPANY, INC. ★ Elkhart, Indiana, U.S.A.



you can't beat TRENTWELD

for *your* tubing requirements



Heat Exchangers built by Vulcan Manufacturing Division, Vulcan Copper & Supply Co., Cincinnati, Ohio.

Whether it's heat exchangers or milking machines, chemical equipment or fountain pens, or any of a thousand other applications, you just can't buy better tubing than TRENTWELD stainless and high alloy tubing.

One reason is that TRENTWELD stainless *welded* tubing is a product of tube mill specialists . . . worlds apart from job shop fabrication. All of our facilities are devoted solely to the production of top quality tubing.

TRENTWELD is made by an exclusive fusion-welding process in which no filler rod is used. Each piece has an accurate uniformly sound weld that is indistinguishable from the parent metal and just as strong and corrosion-resistant.

TRENTWELD is available in an extremely wide range of sizes from ⅛" to 40" O.D. and up, in most grades, gauges and finishes. Trent engineers are experienced in solving tubing problems in many fields. Write now and let us help with *your* application problem.

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STAINLESS STEEL TUBING

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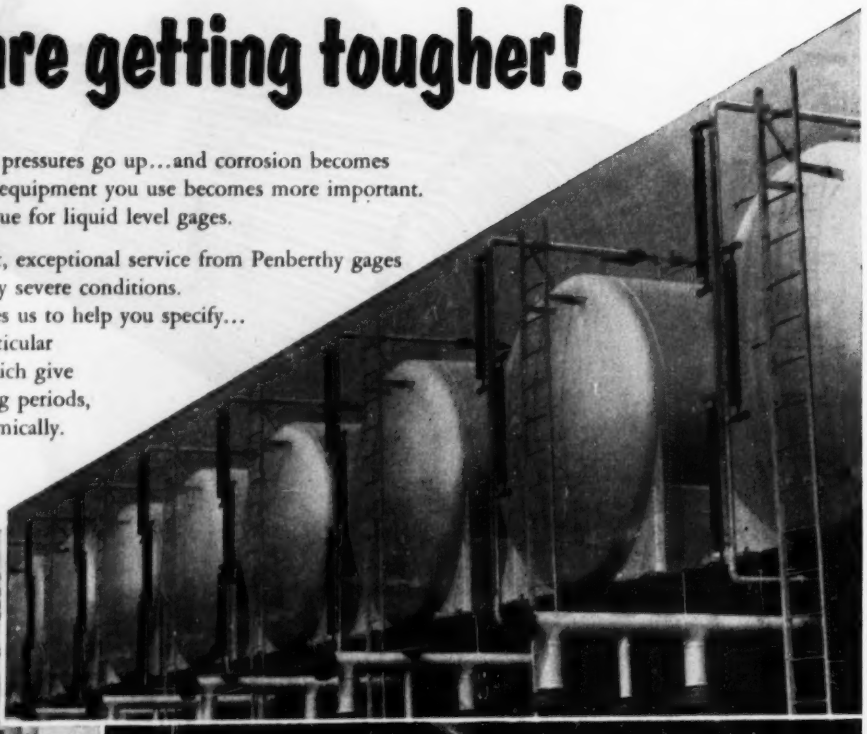
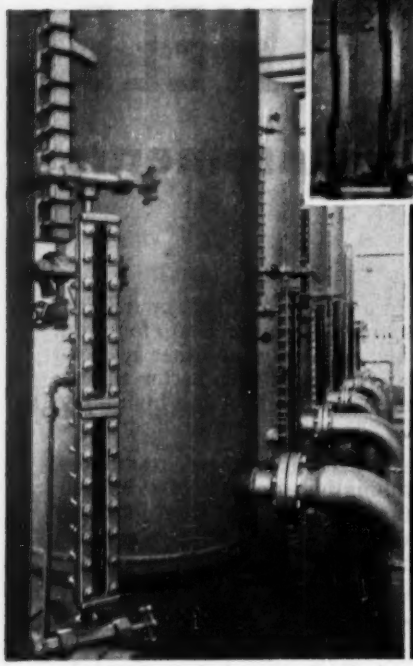
Things are getting tougher!

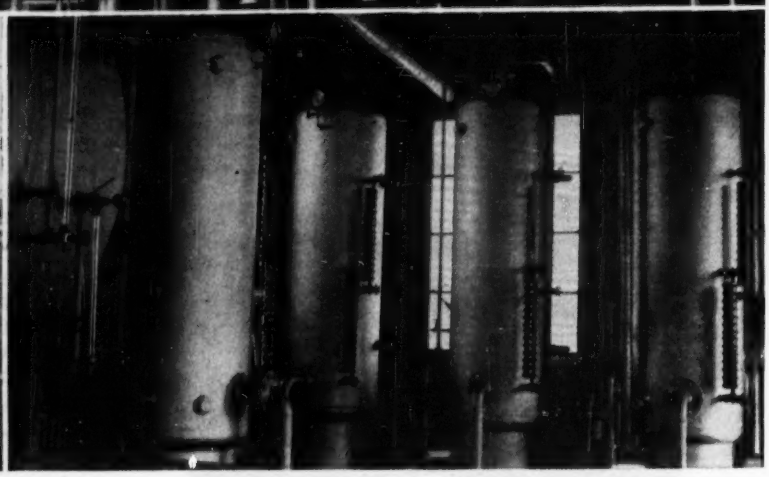
As temperatures and pressures go up...and corrosion becomes more of a problem...the equipment you use becomes more important. That's especially true for liquid level gages.

You can expect, and get, exceptional service from Penberthy gages and valves under increasingly severe conditions.

Our experience enables us to help you specify... or even design to your particular needs...gage sets which give accurate readings for long periods, efficiently and economically.







● *To help you in specifying the right gages for your needs, write for Catalog 35. If your requirements are special, put our engineers to work on them.*

PENBERTHY INJECTOR COMPANY
Division of the Buffalo-Eclipse Corporation
1242 Holden Avenue • Detroit 2, Michigan
Established 1866

Penberthy gage sets are made from carbon, chrome-moly and stainless steel as well as Monel metal. They are also available in acid bronze, Everdur, nickel and Hastelloy. All materials conform to or exceed requirements for maximum recommended pressures and temperatures. The finished products are rigidly inspected and tested under actual working conditions.

And, only with Penberthy Gages, do you get such features as the "Floating Shank" which automatically compensates for as much as ⅜" variation in center-to-center distance of the vessel tapping.

There's Certain satisfaction in **PRODUCTS BY** **PENBERTHY**

- **CYCLING JET PUMPS**
- **EJECTORS**
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- **ELECTRIC SUMP PUMPS**
- **EDUCTORS**
- **EXHAUSTERS**
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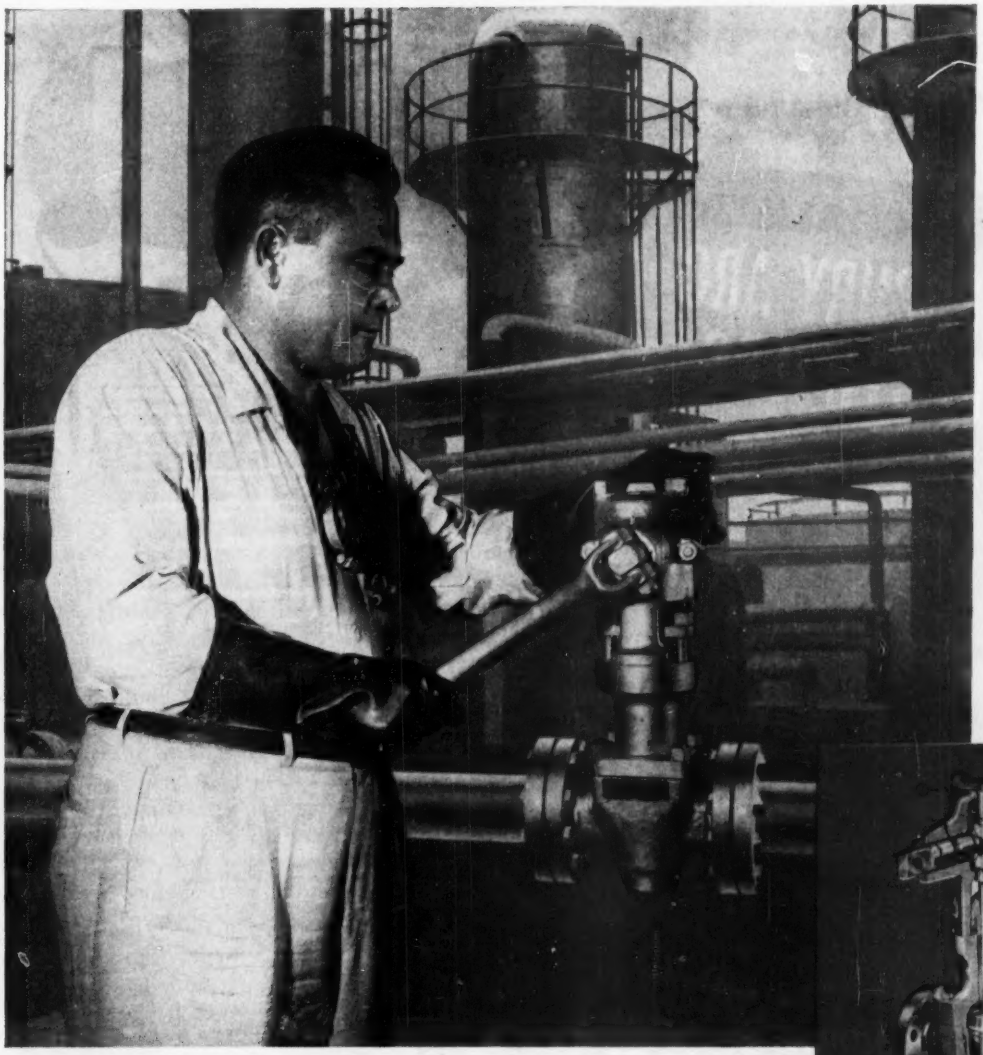
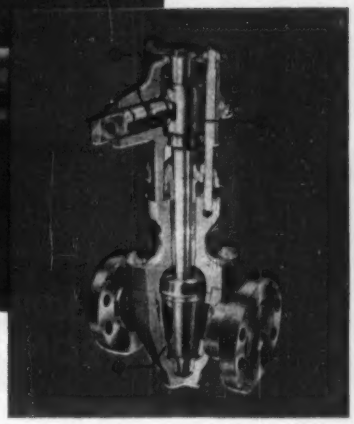


R. F. Farmer, Assistant Sales Manager, Cameron Valve and Oil Tool Division.



Cross-section view of a Cameron Non-Lubricated Lift Plug Valve showing: (1) Position indicator; (2) The Lift-Plug Actuator which, in a three-quarter continuous turn of the lever, lifts the plug free of the seat to prevent scoring and minimize friction, rotates plug to open or closed position, and reseats plug; (3) The renewable seat which is separate from the body and which is therefore not affected by body distortion.

THIS VALVE

is looking for the toughest job in your plant

The Cameron Non-Lubricated Lift Plug Valve has already set new performance records in corrosive services (hydrofluoric, sulphuric, hydrochloric), high temperature services up to 1600° F (molten metals), vacuum (practically absolute), and high working pressures (up to 5000 psi). You are invited to test-operate this remarkable valve in your own difficult services to obtain first-hand information on its unique features: the plug actuator which lifts, turns, and reseats the plug in an almost effortless ¾-turn of a handle; the separate, renewable seat which permits any desired trim; non-lubrication which eliminates periodic maintenance and prevents product contamination.
For complete details, write to:

CAMERON IRON WORKS, INC.
Valve and Oil Tool Division
P. O. Box 1212, Houston, Texas
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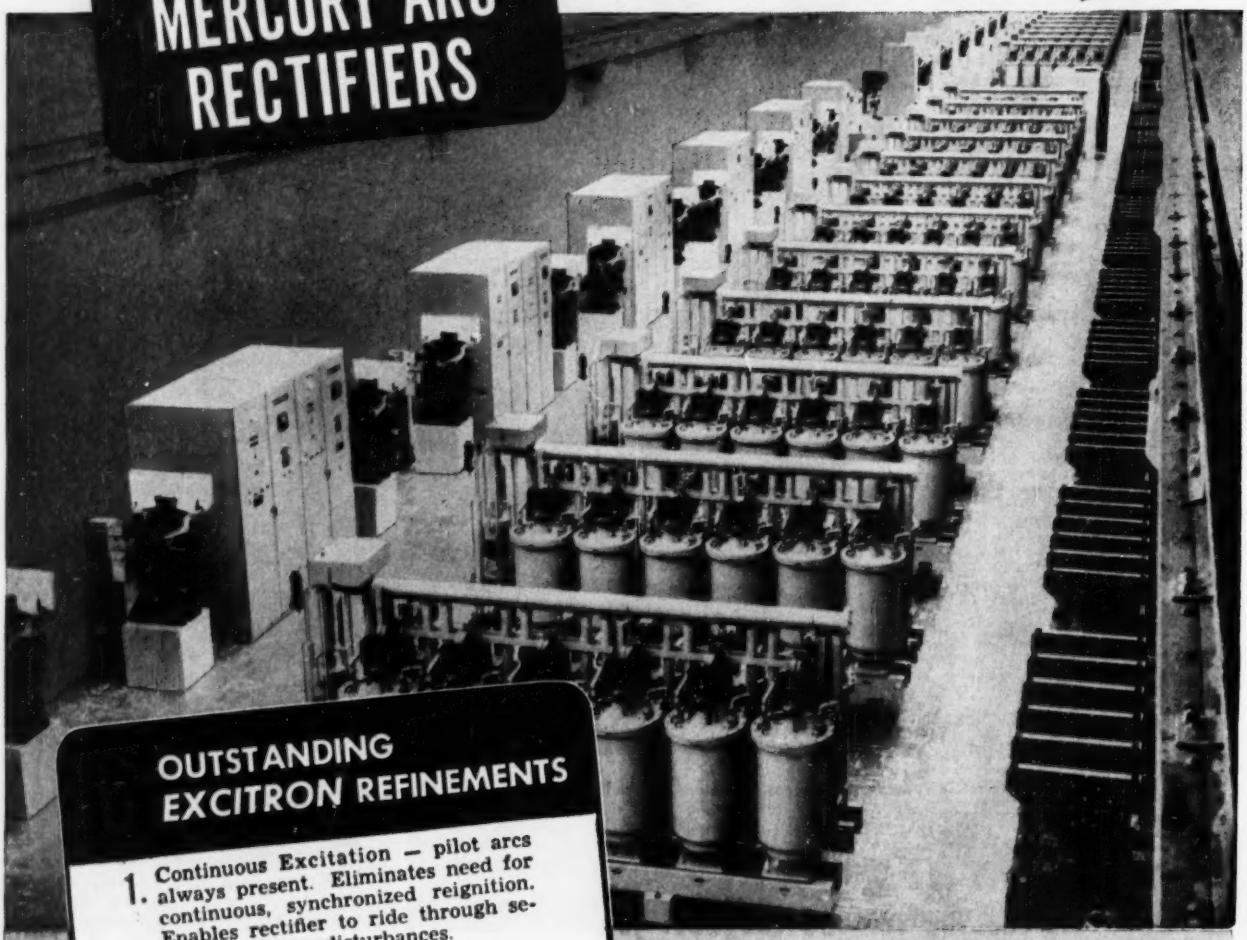
Cameron

NON-LUBRICATED
LIFT-PLUG VALVES

108, MERCURY ARC RECTIFIERS



OUTSTANDING EXCITRON REFINEMENTS

1. **Continuous Excitation** — pilot arcs always present. Eliminates need for continuous, synchronized reignition. Enables rectifier to ride through severe ac voltage disturbances.
2. **Fixed Excitation Anode** — doesn't contact cathode mercury and is independent of level, turbulence or impurities . . . requires no adjustment, maintenance or replacement.
3. **Internal Cooling System** — high heat transfer with seamless-tube cooling coil located within the rectifier.
4. **Enameled Anode Seals** — multi-layer fused vitreous construction provides high-strength seal unaffected by thermal variation.
5. **Grid Phase Control** — in cleaner region near anode, where ion density is lowest.
6. **Arc-over Free Tube** — insulating entire arc path eliminates danger of arcing-over to tube.

A view of the rectifier room at ALCOA's Wenatchee plant. Shown are twenty-four 6000-amp, 750-volt rectifier assemblies connected in pairs to twelve 10,000-kva outdoor rectifier transformers. Each transformer and two rectifier assemblies form a 9000-kw conversion unit.

At the left are cathode breakers and rectifier control cubicles — on the right, high speed anode breakers.

ALLIS-

000 kw
of Reliable DC Power

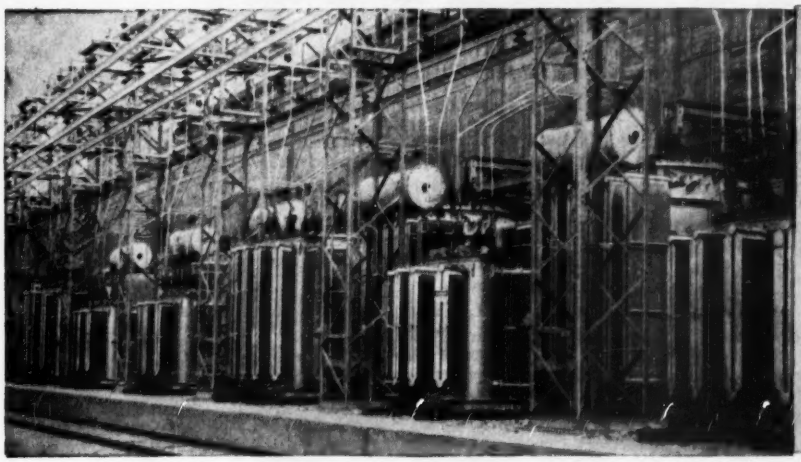
Allis-Chalmers **Excitron** Rectifiers Provide Dependable, Efficient Power Conversion for Newest ALCOA Plant

AT THE RECENTLY COMPLETED WENATCHEE, WASHINGTON PLANT of the Aluminum Company of America, A-C *Excitron* mercury arc rectifiers are providing dependable and efficient power conversion for smelting of aluminum oxide into aluminum.

The aluminum smelting process requires dependable dc power 24 hours a day. Any interruption in this power supply can cause freezing of the molten metal, resulting in serious damage and production loss. And because 9 to 10 kwhr of dc power are required for production of each pound of aluminum, high conversion efficiency is essential for low cost aluminum oxide smelting.

Allis-Chalmers *Excitron* rectifiers are designed and engineered for dependable and efficient operation in every type of industry. They combine the high service reliability, efficiency and low maintenance characteristics of mercury arc rectifiers with additional A-C refinements . . . Continuous Excitation, Fixed Excitation Anode, Internal Cooling System, Enameled Anode Seals, Grid Phase Control, Arc-over Free Tubes.

Whatever your power conversion requirements may be, you can rely on A-C mercury arc rectifiers for dependable and efficient service. For complete information on Allis-Chalmers rectifiers for your plant, contact your nearest A-C sales office or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4156



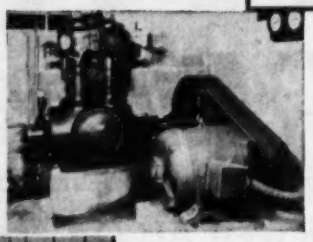
A part of the outdoor transformer yard showing 10,000-kva rectifier transformers and phase shifting autotransformers which produce a 36-phase system. Main 13.8-kv, 3-phase aluminum I-beam section busses supplying all transformers are suspended from crossarms of superstructure with air-break disconnecting switches mounted on top.

CHALMERS

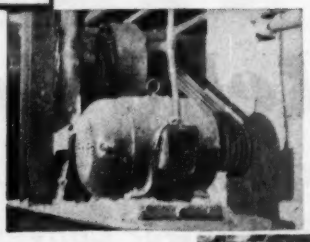
A-C ALLIS-CHALMERS

Our Engineers Introduced Mercury Arc Rectifiers to U. S. Industry

Century C MOTORS



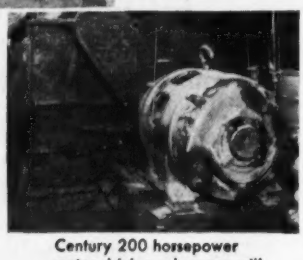
Here is a motor on a refrigeration compressor in a nice clean room. An open type Century general purpose drip proof motor is therefore used.



Century 5 horsepower totally enclosed fan cooled motor drives a mixer in a processing plant.

Here are Century splash proof motors driving fans out in the open, without any protection.

When Your Production Hits a Peak...



Century 200 horsepower motor driving a hammer mill used to crush feed.

Century MOTORS Have STAMINA

The extra ruggedness built into every Century motor is your protection against unforeseen operating conditions.

Leading manufacturers of conveyors, pumps, agitators and many other types of processing equipment rely on Century motors to assure top performance of their products. Motors can be selected from the complete Century line to meet a wide range of power requirements and atmospheric conditions—

- *400 to 1/8 h.p.*
- *AC and DC, single phase and polyphase*
- *Drip Proof, Splash Proof, Dust Proof and Explosion Proof frames*
- *Optional corrosion-resistant features*
- *Constant speed, multi-speed, adjustable varying speed and adjustable speed in fine steps over a wide range*
- *Gear motors*

For performance you can depend on specify Century motors on your new equipment, or for replacement. Your nearby Century Sales Office or distributor is always at your service.

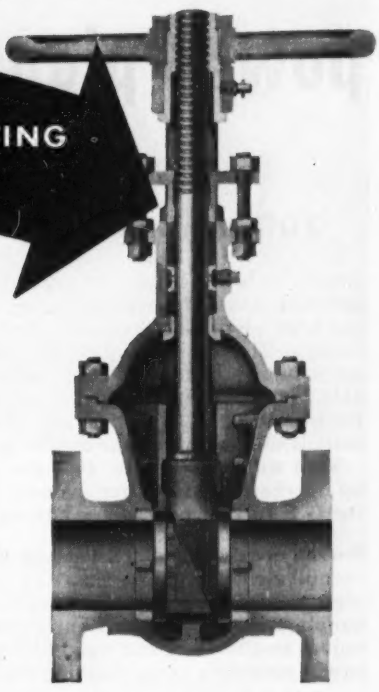
CENTURY ELECTRIC COMPANY • 1806 PINE ST., ST. LOUIS 3, MISSOURI

Offices and Stock Points in Principal Cities

784

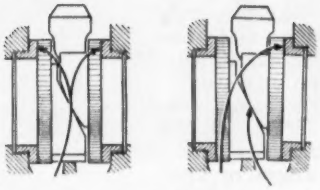
2 WAYS TO GET BETTER VALVE SERVICE!

1 ...UNIQUE DARLING DOUBLE REVOLVING DISC, CAST STEEL GATE VALVE



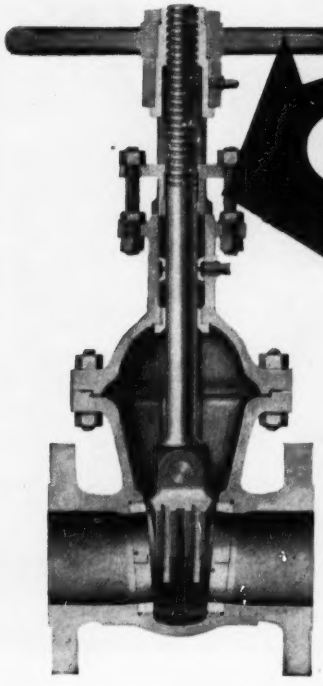
YES, here's a sure way to get better, more dependable valve service. Install this Darling gate valve of the fully revolving double disc, parallel seat type. Time after time users rate it number one for the elimination of down-time and repeated maintenance headaches.

Check the diagrams at right. Note how this Darling gate valve automatically compensates for body distortion, and resulting misalignment of seats. The upper wedge face is radiused, while the lower wedge face is straight, thus disc-to-seat pressure is equalized, assuring tight closure despite distortion and wear.



Discs and seats are parallel. *Seats forced out of parallel by body distortion but discs adapt themselves to give positive closure.* *Radiused face of wedge allows discs to adjust tightly against both seats.*

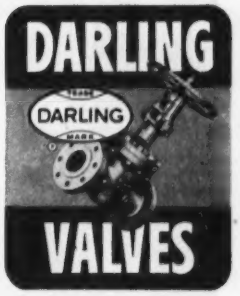
For foolproof simplicity in maintenance and reassembly, and unequalled service life, install this superior Darling Cast Steel Gate Valve.



2 ...DARLING SLOTTED WEDGE CAST STEEL GATE VALVE

HERE'S the second good way to get better valve service. This Darling gate valve's slotted wedge provides *flexibility* when it's needed! It automatically compensates for expansion and contraction due to temperature changes, avoids leaks and minimizes wear and tear on the wedge faces and seats.

What's more, the wedge has *double* guide grooves which engage twin ribs in the valve body. This provides twice the usual bearing area, assuring smooth trouble-free alignment every time!



FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN

EVERY NEED. *Darling gate valves are made in a wide range of sizes, types and constructions for all kinds of normal and unusual service . . . and for pressures up to 1500 pounds.*

DARLING VALVE & MANUFACTURING CO.

Williamsport 3, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

Efficient General Electric gas turbine power plant reduces operating costs

Utilizing exhaust-heat-recovery boiler, G-E unit can attain 70% thermal efficiency, provide up to 120,000 lbs/hr process steam

Improved heat balance, elimination of separate boiler facilities, and a steam supply of up to 120,000 pounds per hour—with supplementary fuel firing—make the General Electric combustion gas turbine an efficient, economical prime mover for plants requiring considerable amounts of steam for process or other plant uses. Even without supplementary fuel firing, 40,000 pounds of steam per hour can be generated.

Well suited for either 4000 kw generator or 5700 hp mechanical drive for blowers and compressors, the G-E turbine offers these advantages:

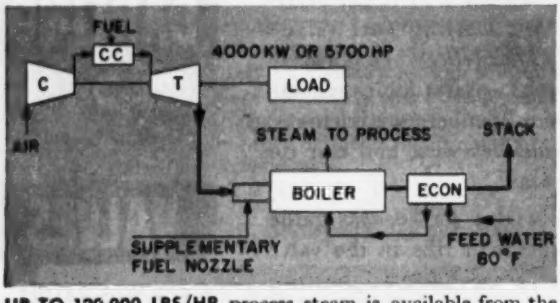
Proven in actual service, over 130,000 operating hours—equivalent to more than 15 years—have been accumulated by G-E gas turbines in industry.

Simple building construction is possible because the unit is small in size and weight.

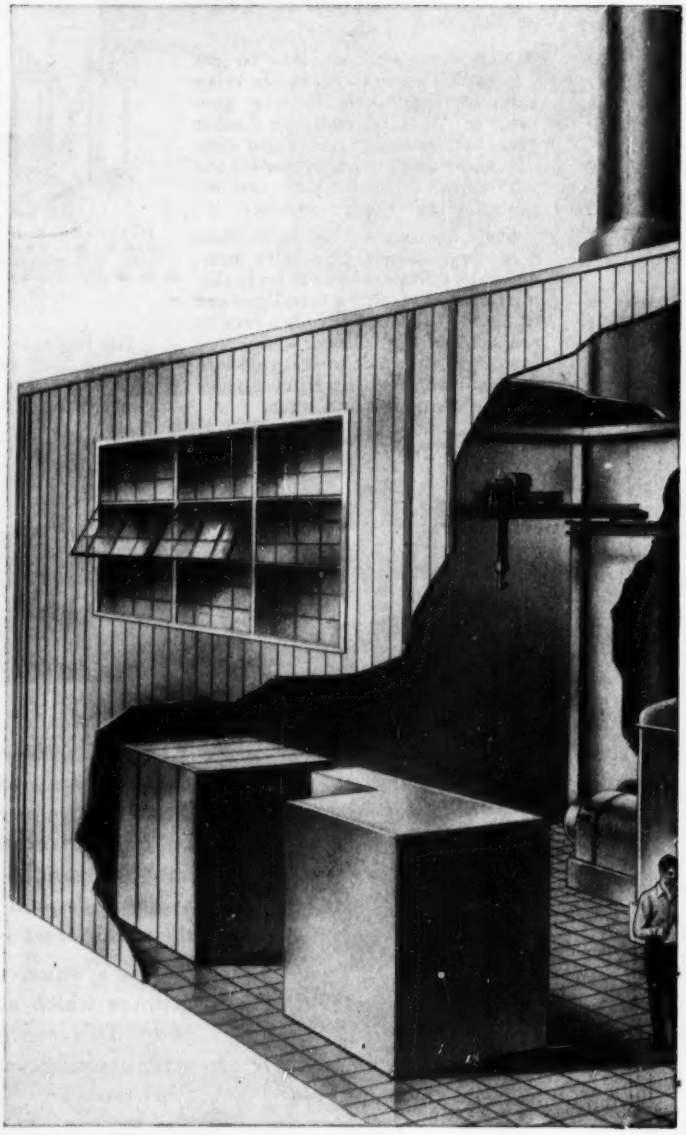
Lower operating costs resulting from:

- high power plant efficiency with exhaust heat utilized to supply plant steam and heat.
- reduced maintenance due to inherent simplicity of this rotating equipment.
- fewer personnel required to operate small, compact gas turbine power plant.

G-E gas turbines climax more than 45 years of successful turbine building. Contact your G-E Apparatus Sales representative and discuss the applications of a combustion gas turbine in your plant. Or, write for technical article GER-754, "Where Industry Can Use the Gas Turbine," General Electric Co., Section 662-45, Schenectady 5, New York.



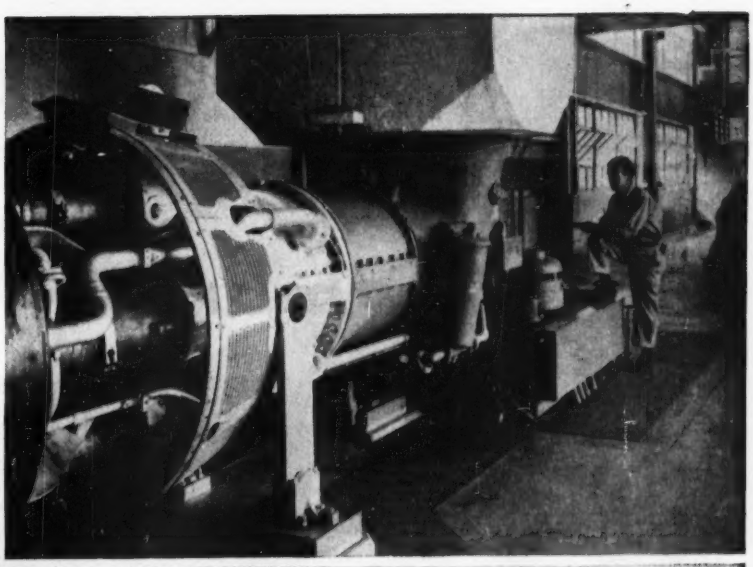
UP TO 120,000 LBS/HR process steam is available from the General Electric gas turbine power plant using a supplementary fired exhaust-heat-recovery boiler. Even without supplementary fuel firing, 40,000 lbs/hr is generated.

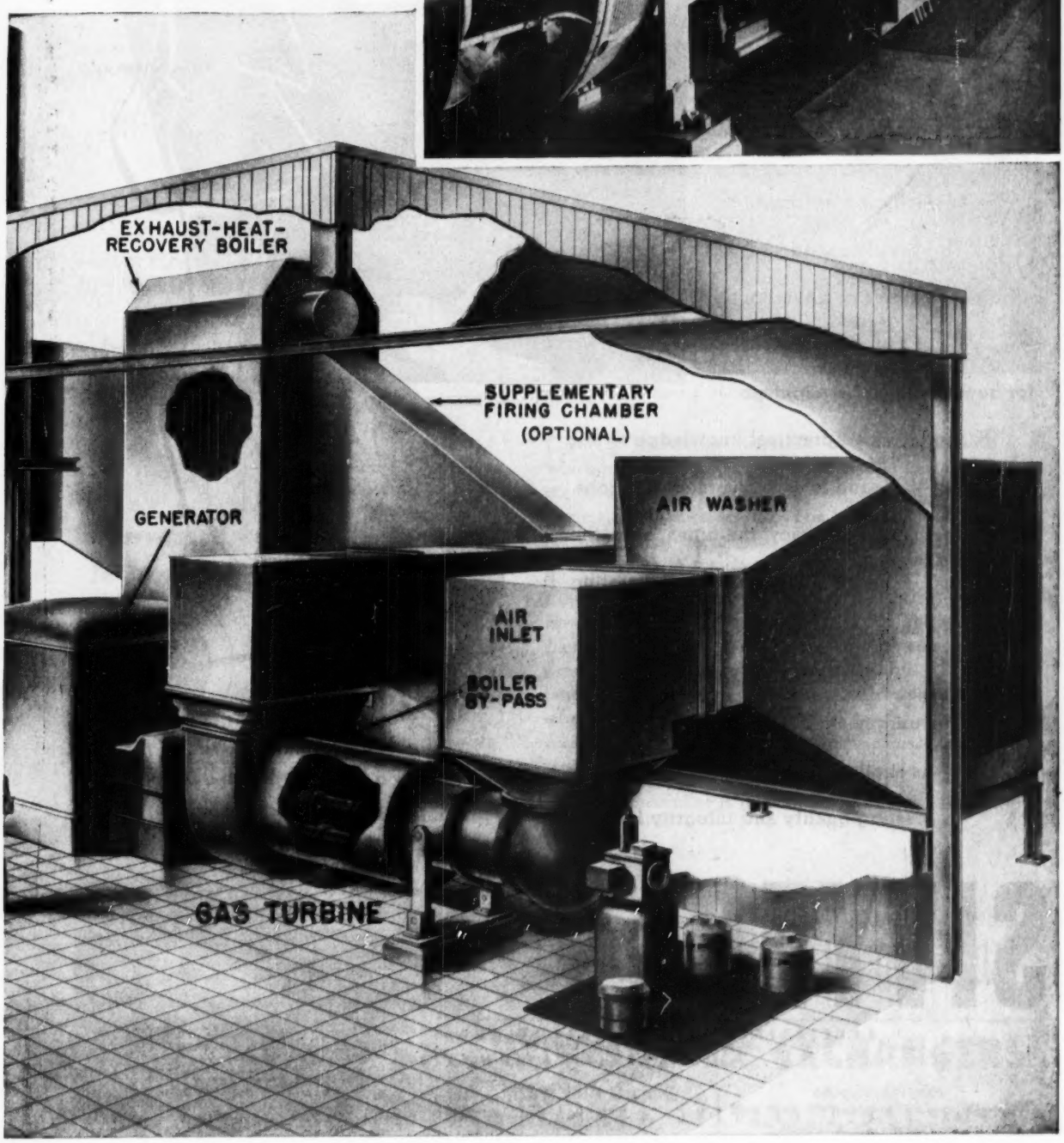


GENERAL ELECTRIC

OVER 30,000 HOURS OF ACTUAL OPERATION have been accumulated on this G-E combustion gas turbine since its installation at the Oklahoma Gas and Electric Company. Exhaust-heat-recovery system preheats boiler feed water for power plant use.

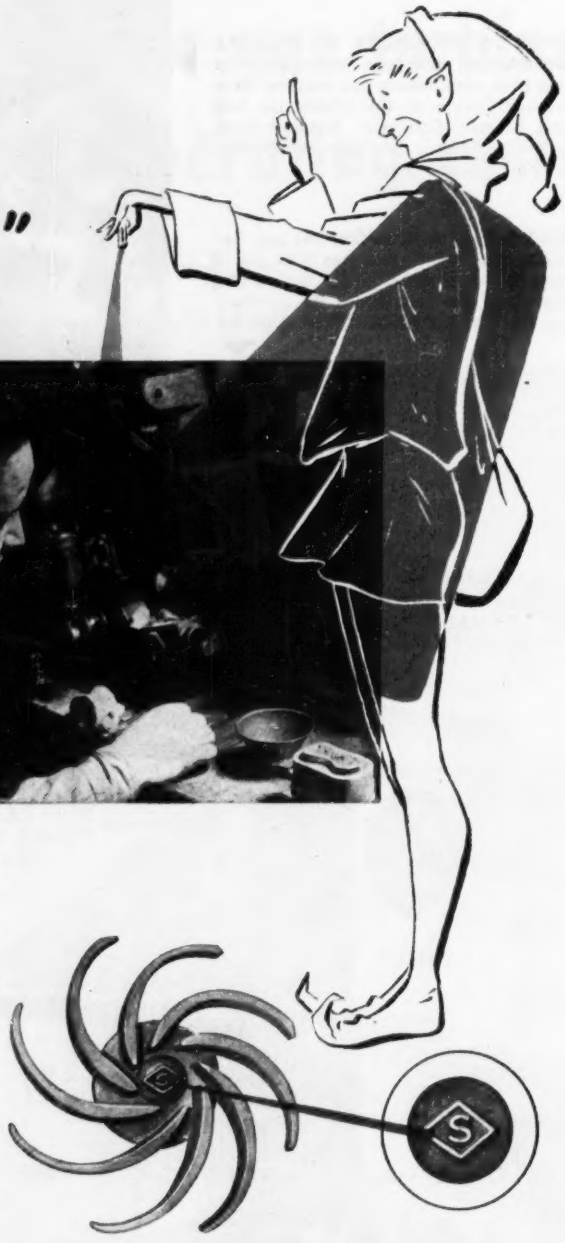
EFFICIENT AND ECONOMICAL gas turbine power plant generates 4000 kw of electric power at .8 power factor. Gas turbine is also well suited for mechanical-drive applications up to 5700 hp.





meet the "Sandman"

Yep! . . . there really is a sandman! Sivyer's sandman, however, is a symbol of vigilance . . . for he uses special equipment and a broad practical knowledge to test sand for specific moulding jobs. Dimensional accuracy, the finish, even the internal flawlessness of a casting may depend on his tests for proper bond, grain size, and permeability. The unique skill of our sand laboratories is another Sivyer service that insures casting quality and integrity for you.



wake up to better steel castings

A letter or a wire will get you prompt action and details on any problem or service involving high alloy and specification steel castings. Get acquainted with the famous Sivyer for better castings.

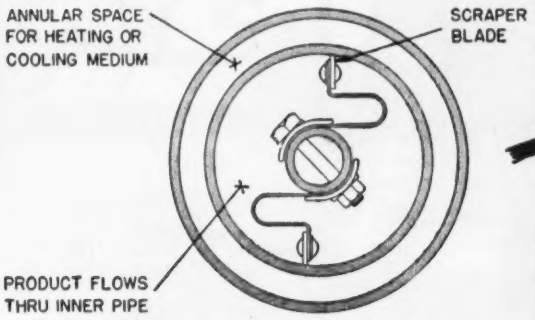
SIVYER

SPECIALISTS IN HIGH ALLOY AND SPECIFICATION STEEL CASTINGS

SIVYER STEEL CASTING COMPANY • MILWAUKEE CHICAGO

Time to Change...

...FROM BATCH TO CONTINUOUS PROCESS



Section thru Double Pipe Exchanger

Scraped Surface Exchanger Unit under test in our shop

Unsurpassed for Top Performance in Processing characterized by:

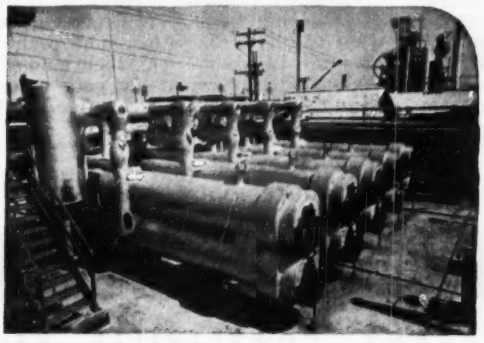
1. Heat transfer with crystallization
2. Heat transfer with severe fouling of surfaces
3. Heat transfer with solvent extraction
4. Heat transfer with continuous mixing and conveying
5. Heat transfer with high viscosity

Chemical processors in search of equipment with which to modernize operations are invited to consider the possibilities of Vogt *flow-thru* Scraped Surface Exchangers in such service. The wide range of uses to which they have been adapted indicates their definite value in the chemical processing fields.

Vogt Scraped Surface Exchangers are closed, *flow-thru,* pressure type systems which permit the use of flammable, volatile and expensive solvents with greatest safety and no danger of solvent loss. Usually fabricated from ferrous material, their simple construction permits the ready use of special materials such as pure nickel or stainless steel to meet special requirements.

General information is in Bulletin PE-1, write for it.

An outdoor installation of Scraped Surface Exchangers

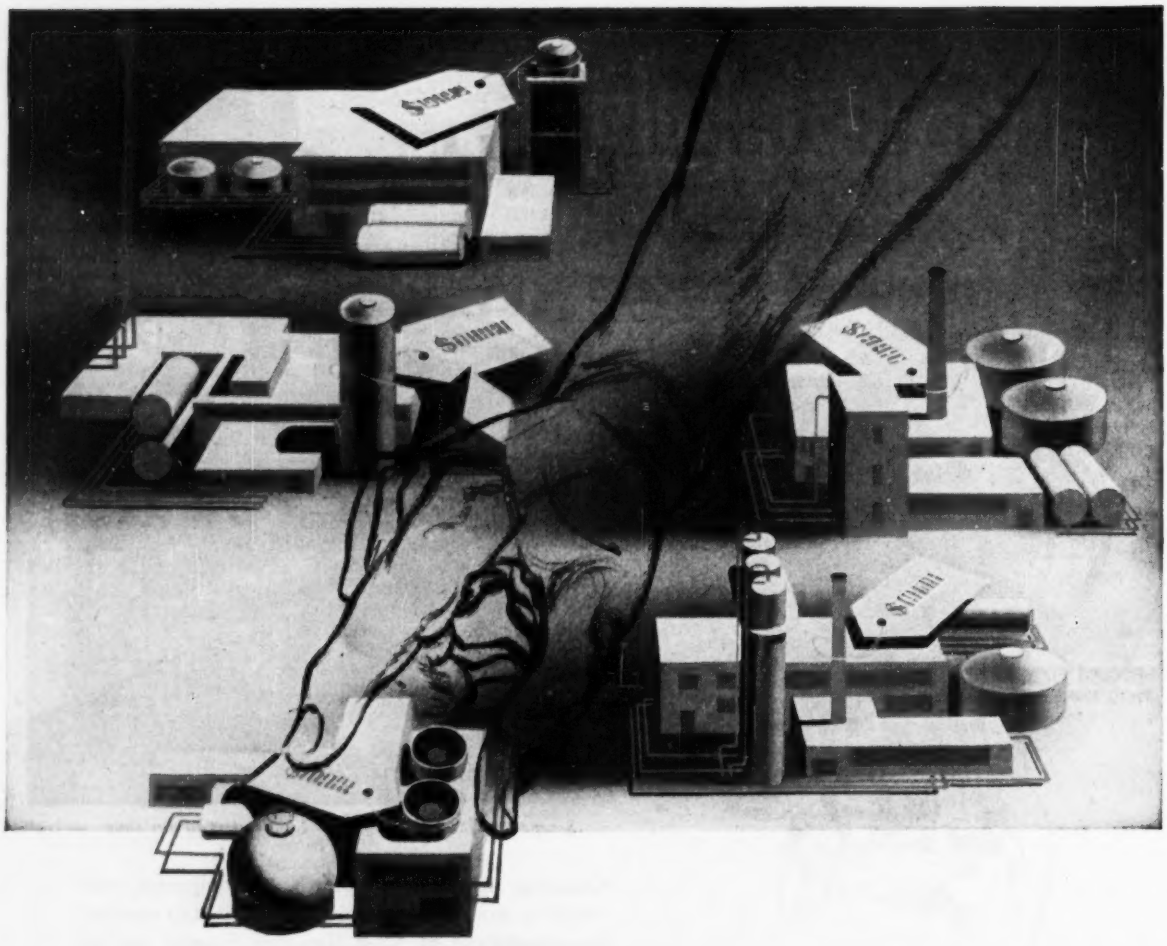


Vogt *flow-thru*

Scraped Surface EXCHANGERS

HENRY VOGT MACHINE CO.
LOUISVILLE, KY.

BRANCH OFFICES:
New York, Philadelphia, Chicago, Cleveland
St. Louis, Dallas, Charleston, W. Va.



How to Shop for Extra Productivity

If you feel the output of your plant could be increased, you may be interested in what a company we know did. Their *process* probably differs from yours. But the way the problem was approached applies.

This company wanted economical drying of sodium chloride from a moisture content of 5% down to .01%. Protection of product purity was a must. The answer, in their case, was three continuous-flow, rotary-type driers of nickel-clad steel with solid nickel baffles. The driers are internally heated to 320° C. by four burners using natural gas. Ring gears rotating the drums are spring-mounted to relieve load and wear on teeth. Nickel working surfaces and parts protect the product from metallic contamination, and the equipment from corrosion and abrasion.

Rapid, economical drying resulted—60 tons of salt per drier per 22-hour day. Seeing this performance, this company ordered a battery of three more driers to bring its total to six.

Can more dollars be squeezed out of your throughputs? This company did it through combined planning by the engineering staffs of progressive Equipment Builders, process engineers, designers and materials suppliers. Such builders turn to Lukens regularly for its knowledge of materials and its wide range of low-cost clad steels.

Even with new equipment hard to get, these builders can often recondition what you have for better, more profitable use. Would you like their names? Write us today explaining your need. Manager, Marketing Service, 400 Lukens Bldg., Coatesville, Pa.

LUKENS

World's Leading Producer of

SPECIALTY STEEL PLATE · PLATE SHAPES · HEADS · CLAD STEELS

LUKENS STEEL COMPANY, COATESVILLE, PA.

Chempump... a NEW

and proved* concept in pump design

For the first time, here is a pump that will eliminate virtually all of your pump maintenance problems. There is no packing to tighten or adjust . . . no mechanical seals to fail . . . no lubrication needed. The combined rotor and impeller assembly, which is actuated by a radial magnetic drive, is the only moving part.

Chempump prevents losses of valuable liquids . . . keeps explosive, toxic and highly volatile liquids sealed in. Corrosive liquids can't start stuffing box trouble. Besides protecting your plant and personnel, Chempump protects the fluid being pumped from external contamination . . . especially important in vacuum applications.

Chempump is available in 1/3, 3/4, 1, 2, and 3 horsepower sizes . . . open or enclosed impellers. Standard materials are cast iron, 300-series stainless steel or Monel. Special materials on request.

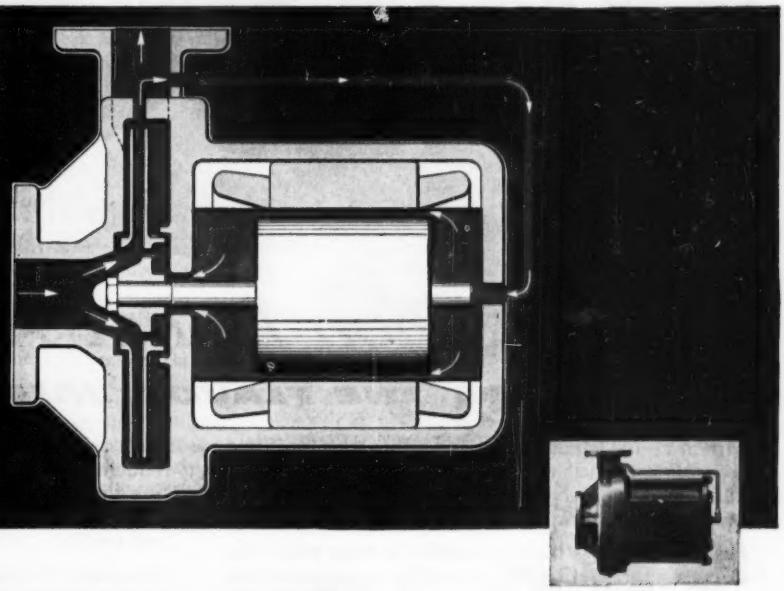
For complete information and performance data, clip the coupon below and send it in.

no shaft seals or stuffing boxes

totally enclosed ...motor and all

seal-less and leakproof

Secret of the Chempump is the enclosed rotor impeller. Radial magnetic drive actuates a standard hydraulic impeller through a short *solid* shaft. Fluid circulates freely through rotor chamber of motor. Stator is isolated from fluid by a corrosion resistant, non-magnetic alloy cylinder inserted in air gap. Rotor is hermetically sealed by same alloy. U. L. approved.



Chempump

CHEMPUMP CORPORATION • 1300 E. Mermaid Lane • Phila. 18, Pa.

Chempump is the result of experience gained from over 15,000 field installations on seal-less pumps.

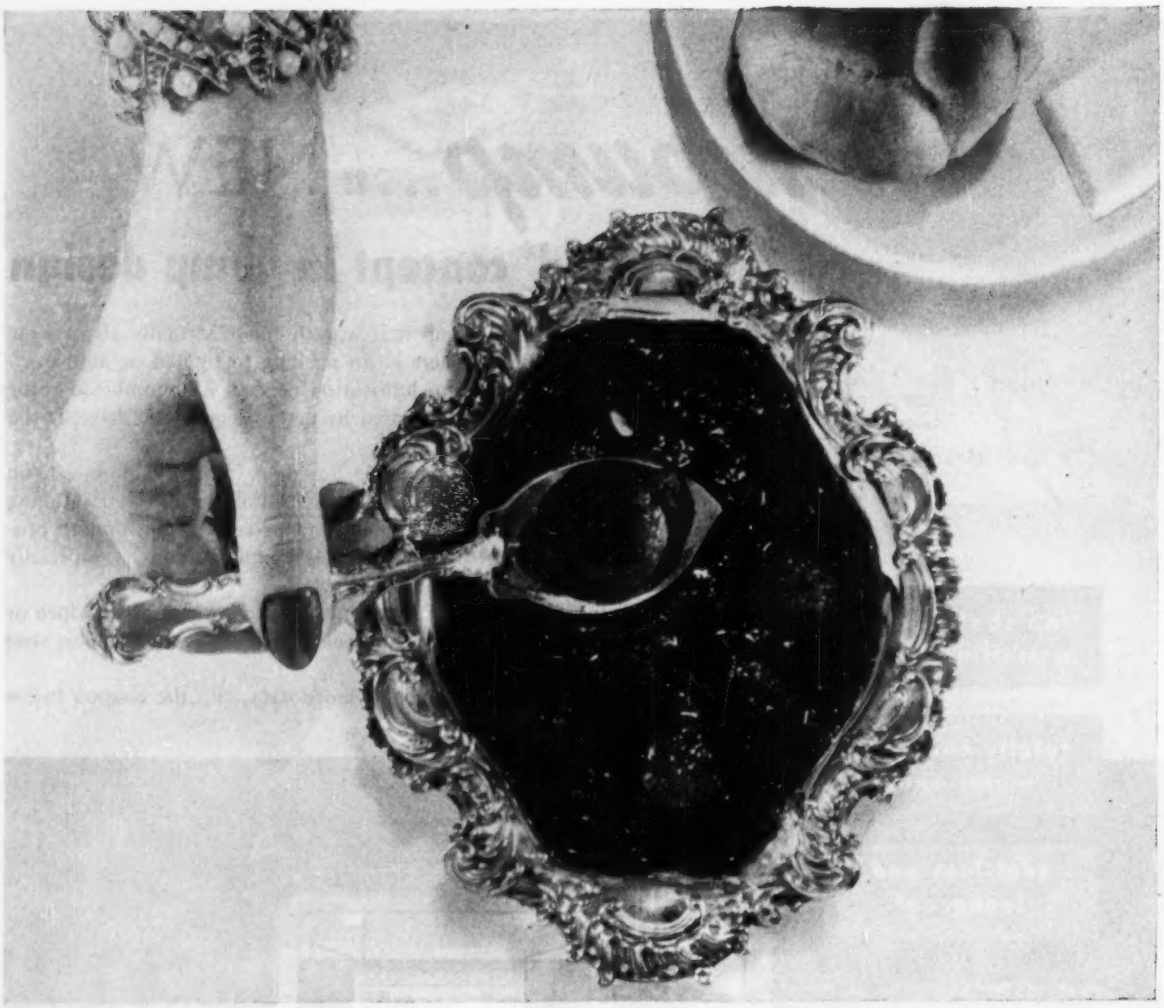
CHEMPUMP CORPORATION • 1300 E. Mermaid Lane • Phila. 18, Pa.

Please send complete Chempump performance data.

Name..... Title.....

Company.....

Street..... City & State.....



"Million Dollar Magic"

KEEPS THE FLAVOR JAM-DANDY!

Mm-m-m-m! Delicious jams and jellies with that "just right" flavor. And Swenson engineering "magic" helps keep the flavor full and natural through the improved production of *pectin* for the food industry.

Because pectin is highly sensitive to heat which decreases gel strength and damages flavor, accurate time and temperature control is essential in the concentration of the pectin liquors. Swenson engineers, using the Swenson Long Tube Vertical Evaporator, developed a single pass cycle for each evaporator effect . . . reducing heat exposure time to a minimum, permitting the use of rapid, high temperature evaporation with complete safety. The result was *improved* lower cost pectin.

Swenson's "million-dollar magic" has helped many leading processors achieve better results and bigger profits. *Next could be your product!* Why not discuss it with a Swenson engineer now . . . write to:

SWENSON EVAPORATOR COMPANY
15669 Lathrop Avenue, Harvey, Illinois

SWENSON

Proved Engineering for the Process Industries
SINCE 1889

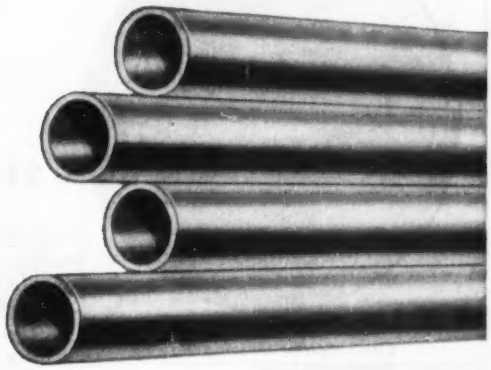
A Division of WHITING Corporation

Evaporators Crystallizers Spray Dryers Filters

You're sure of UNIFORM HIGH QUALITY

SEAMLESS • PRESSURE • MECHANICAL CARBON STEEL TUBES

when you specify GLOBE



SIZE RANGE — WALL THICKNESS

Globe seamless carbon steel tubes are available in a size range of ½ inch to 7½ inches O.D.; wall thickness of .028 to 1.000 inch.

APPLICATIONS

Globe Pressure Tubes are used for boilers, condensers, heat exchangers and process equipment. They meet most exacting demands of modern high pressure and high temperature installations. Globe Mechanical Tubing (seamless) is produced by piercing solid billets. It is an ideal material for load-bearing structural members and parts where strength with minimum weight is needed. Its economy for the manufacturing of many machine parts is universally recognized.

Globe seamless carbon steel tubes are furnished to standard specifications in low and medium carbon ranges.

WHEN you specify Globe you are sure of uniform high quality carbon steel tubes. That's because they are the product of highly developed production facilities and specialized quality controls and methods.

Globe engineers are at your service to assist in the selection of tubing of the exact characteristics you require.

GLOBE TUBES

GLOBE

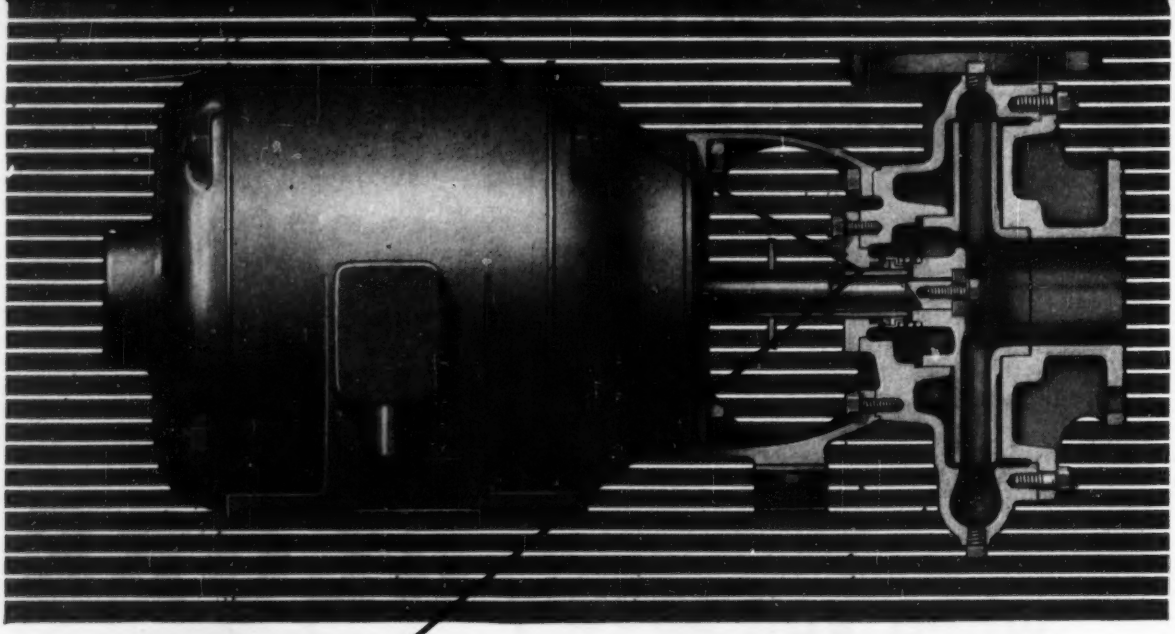
STEEL TUBES CO.

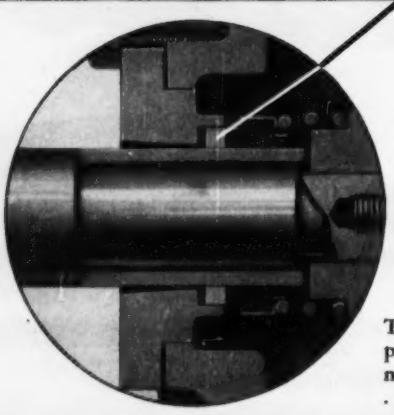
MILWAUKEE 46, WISCONSIN

Chicago • Cleveland • Philadelphia • St. Louis • New York • Detroit • Denver • Houston • San Francisco
Glendale, Calif.

Producers of Globe seamless stainless steel tubes — Gloweld welded stainless steel tubes — alloy-carbon seamless steel tubes — Globeiron (high purity ingot-iron) seamless tubes — Globe welding fittings.

NEW *Remite* SEAL ENDS LEAKAGE TROUBLES





Cross-section showing Remite Mechanical Seal.

B&G *UNI-BUILT*

SERIES 1531 CENTRIFUGAL PUMP

The "REMITE" Mechanical Seal of this pump presents a revolutionary new development in pump design . . . eliminates leakage . . . assures long, trouble-free life.

A carbon seal ring faces on a "REMITE" floating seat—a new type of material, *so hard it will scratch glass*—wear-proof and corrosion-resistant! This Seal is self-lubricating.

Note the pump shaft . . . super-finished high grade steel . . . oversized for minimum deflection . . . quiet. The impeller is of sound hydraulic design, mechanically balanced, with balance ring and relief holes to reduce thrust. The heavy duty ball-bearing motor is normally furnished as drip-proof, but is also available in splash-proof, totally enclosed and explosion-proof models.

B & G Series 1531 Uni-built Pumps are made with capacities to 1200 GPM, heads to 400 feet.

Send today for catalog No. ET-452, giving complete engineering data on the B & G Series 1531 Uni-built Centrifugal Pump.

BELL & GOSSETT
COMPANY
Dept. DG-14, Morton Grove, Ill.

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto, Canada

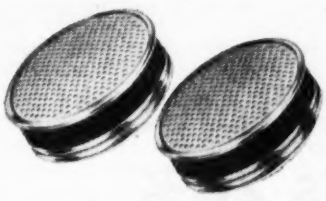
SIMPLIFY

Respiratory Protection and Inventory with the AO R5000

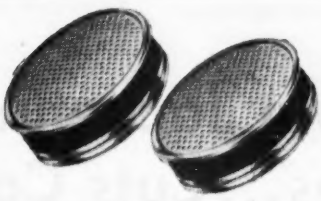
Respiratory Protection

(One Face Mask—Seven Sets of Cartridges Do Work of 7 Respirators)

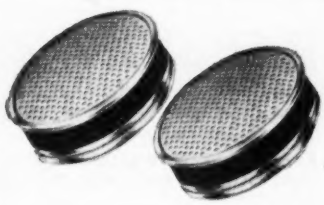
If yours is a multi-respiratory hazard operation, you can streamline the protection problem and the equipment needed to meet it by concentrating on the AO R5000. This twin cartridge respirator converts to many types of protection by interchanging the following cartridges:



R51—For light organic vapors and gases of paint spraying, degreasing, dry cleaning. B. M. 2304.



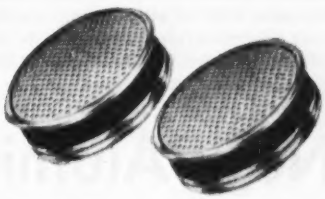
R53—For combined acid and organic gases like carbon tetrachloride and acetic acid.



R52—For acid gases, and mists of plating operations, pickling tanks, etc.

R54—For protection against low or nuisance concentrations of ammonia.

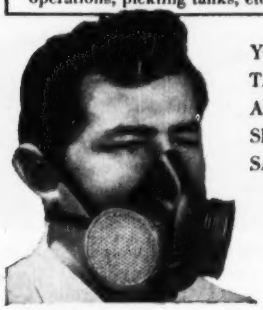
R55—For workers who are exposed both to organic vapors and all dusts. B. M. 2305.



R56—For fumes produced in welding, burning, smelting and refining. B. M. 2163.

R50—For combination of all dusts, toxic, pneumoconiosis-producing, nuisance. B. M. 2156.

AO's Industrial Vision Program Increases Production, Decreases Accidents. Write today for booklet, "Improved Industrial Vision".



AO R5000 RESPIRATOR

YOUR NEAREST AO SAFETY PRODUCTS REPRESENTATIVE CAN SUPPLY YOU WITH THE FACE PIECE AND COMPONENTS REQUIRED TO MEET YOUR SPECIAL NEEDS. HE ALSO SUPPLIES INDUSTRIAL SAFETY GLASSES AND PROTECTIVE CLOTHING.

American Optical

SAFETY PRODUCTS DIVISION

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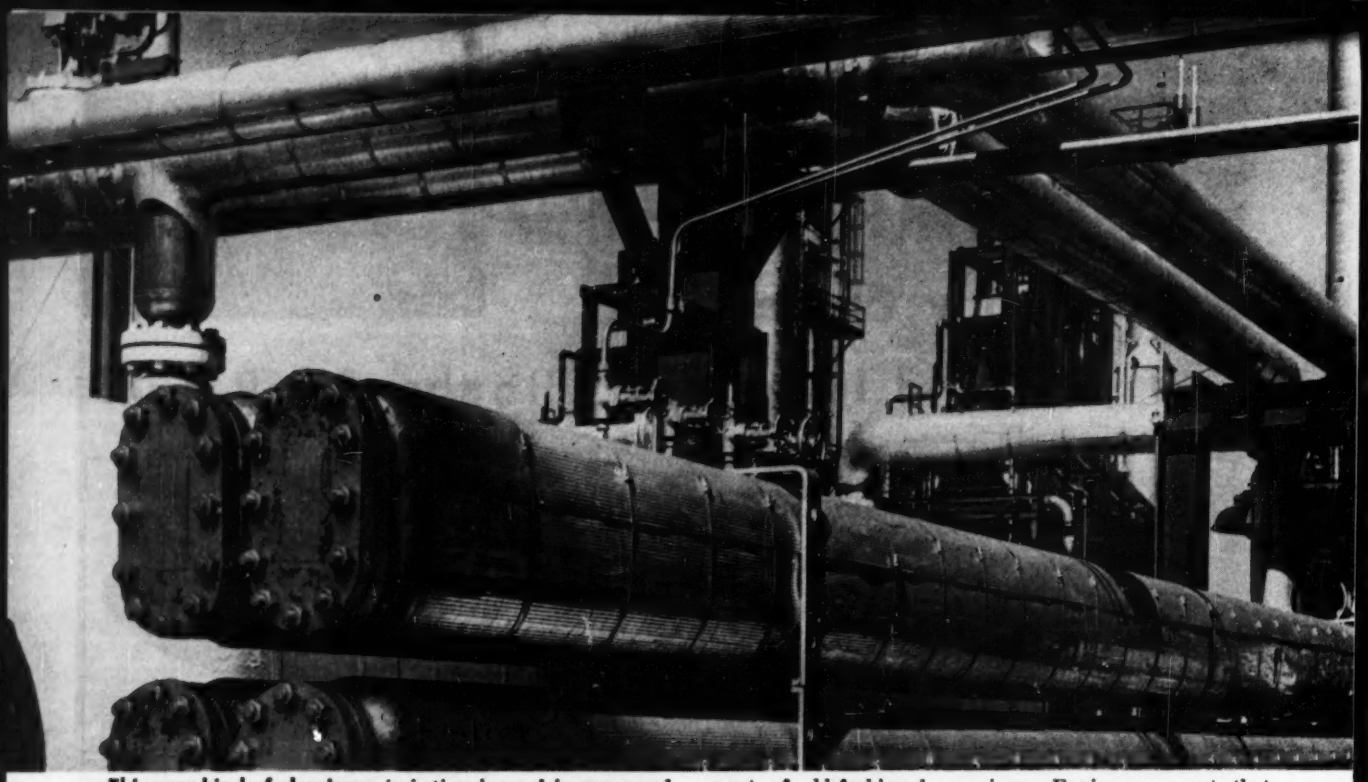


This new kind of aluminum jacketing is used in more and more outdoor processing plants to protect insulated towers, vessels, lines—it eliminates costly maintenance and replacement of old-fashioned coverings. Engineers report that Childers Jacketing has advantages not found in expensive heavy sheet aluminum, costs less to buy, far less to apply.

New Aluminum Jacketing Protects Insulated Lines...Cuts Costs 28%

How 986 of America's Leading Companies Saved Money By Weather-proofing Insulated Lines This New Way:

A two-man crew can apply the jacketing fastest. Only tools are a pair of pliers and a wedge or screw driver as shown here. Note how easily the jacketing forms around the pipe.

Aluminum strapping can be pulled plenty tight enough with just pliers like this. No special strapping tool needed. Strapping is pulled down between lugs and bent over.

Up-to-date appearance, low cost, and long life go hand in hand in a new aluminum jacketing for insulated lines. Developed by Childers Manufacturing Co., Houston, Texas, it is the first permanent weather-proofing that offers both low initial cost and low application cost.

Childers Jacketing, made of tough 3S aluminum alloy for maximum corrosion resistance, lasts years without painting or other maintenance. It costs less than even the cheapest kind of weather-proofing, when the cost of one paint job is considered. Savings run up to 28%.

Cost-minded engineers are also impressed with the gleaming beauty of Childers Jacketing that means "good plant housekeeping."

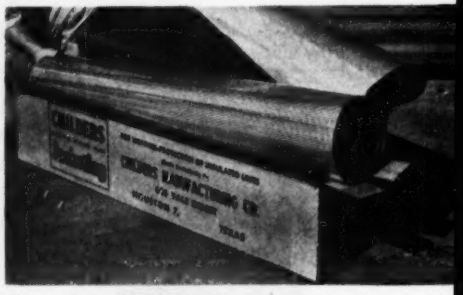
Available with moisture barrier attached, for use over 85% magnesia insulation.

5 years of tests and major installations in 986 of America's leading processing plants, refineries, and power plants have proven the advantages of Childers Aluminum Jacketing over other types.

Try this low-cost protection in your plant. Write today for engineering data and information about how you can order a 400 sq. ft. roll to test on one of your insulated lines. No obligation.

Address Childers Manufacturing Co., Dept. CE-7, 3620 W. 11th St., Houston 8, Texas.

Engineering representatives in all principal cities to work with you on your problems.



This is how the flexible, easy-to-handle Childers Jacketing arrives at the job site. It is in convenient rolls 4 feet wide and 100 feet long—just right for one man to handle—and is available either with or without a moisture barrier attached on the back of the .006" aluminum "skin." It can be cut to proper lengths using any flat table and a straight-edge. (Advertisement)

DORRCO DOINGS IN 1953

The story of the blind men and the elephant is recalled by today's outlook. One sees only the military strength behind the Iron Curtain, greatly enhanced by the free world's blindness, and feels we should expect hell to come the next minute.

Another, thinking back a few years, sees now great advances in so many areas—no actual fighting in Korea, great physical and moral strength in our European allies, and evidences of internal breakdown in East Germany and other areas behind the Iron Curtain.

We feel that education must be permeating slowly and that in time a reaction will take place. To those of us who are impatient I would recommend Henry Field's fascinating "The Track of Man" to learn how many of our problems reach back 5000 years.

* * *

NEW DEVELOPMENTS — Collaborating with our Associates in Holland, we have developed the application of the TM Dorr-Clone to the starch industry on a commercial scale. This new unit is also proving broadly successful in filtrate clarification and fine sizing of materials in the 2 to 20 micron range.

The Aldrich System, consisting of an annular sand filter combined with a mechanical pre-treatment unit, provides complete water purification in a single machine. A new method of sludge thickening has been developed for sewage treatment which substantially reduces digestion capacity requirements.

As a result of continuing efforts to increase the efficiency of the Dorr Continuous Recausticizing System, the Dorrco White Liquor Polishing Station was added to our line in 1953. It further clarifies the effluent of the White Liquor Clarifier by removing colloidal material which cannot be handled by gravity separation.

WATER TREATMENT — Two 200 ft. pre-sedimentation Thickeners were installed at Kansas City, Missouri, to remove turbidity from Missouri River water prior to conventional purification steps, and Dorrco Flocculators and Monorakes helped provide Dayton, Ohio with an economical new 96 MGD treatment plant. The trend first mentioned in 1952 of the mechanization of plants serving small communities continued again last year.

SEWAGE AND INDUSTRIAL WASTE — Pennsylvania's Clean Streams Program brought for Easton and Bethlehem two outstanding new sewage treatment plants employing Biofiltration and Multdigestion. The world's largest Biofiltration plant, now under construction at Beaumont, Texas, will incorporate four 195 ft. dia. Dorrco Distributors. A large Dorrco d-i System was ordered to clean up a copper, nickel and chrome plating waste for one of America's largest automobile producers.

METALLURGICAL — At the Robena Mine of U. S. Steel Corporation's Coal Division, a 6″ dia. DorrClone, equipped with the new Type CB abrasion resistant liner, showed only negligible wear after over 2300 operating hours on the line. On the Mesabi Range, the Dorr 4-Arm Torq Thickener found extensive application handling taconite mill tailings during the year, and noteworthy metallurgical orders included 16 HX Classifiers and 20 DorrClones for closed circuit grinding of copper ore and acid proof rake Classifiers for washing sandy pulp in a uranium extraction plant.

FERTILIZER PLANT DESIGN — Evidence of continued interest in the fertilizer field is the design of a phosphoric acid plant for Norway and an ammonium phosphate plant for Japan. Engineering initiated in 1952 was completed on a triple superphosphate plant in Florida for The Davison Chemical Corp., and work continued on a large concentrated mixed granulated fertilizer plant for Missouri Farmers Association. Both of these plants will go into operation in 1954.

ABROAD — Once again our Associates overseas have had a very prosperous year. A marked increase has been noted in the number of South American and Near Eastern projects handled by our European companies, and, to facilitate delivery, we have instituted local manufacture of our equipment in Brazil. Among the many installations put into operation or under construction this year were a sewage treatment plant in India, a cyanide plant in Yugoslavia, two FluoSolids Systems to roast pyrite in South Africa, and a project involving the FluoSolids treatment and leaching of a copper-zinc concentrate in Japan.

FLUOSOLIDS — Two FluoSolids Systems went into operation in the United States alone in 1953 producing SO_2 gas for the manufacture of a daily total of 600 tons of sulfuric acid by the contact process. FluoSolids Systems were in operation or under construction by the end of the year for sulfite paper mills with a total capacity of three-quarters of a million tons of pulp per year; the roasting of zinc concentrates and subsequent electrowinning or retort smelting of about 100,000 tons of metal annually; the roasting of gold ores for the cyanide recovery of almost 25 million dollars worth of gold per year; and sulfuric acid plants with an annual capacity of about one million tons of acid. Our work on fundamentals has continued, and many new applications of FluoSolids and FluoDry show great promise.

* * *

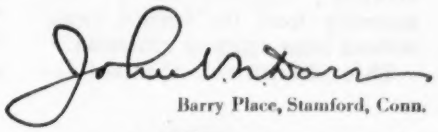
'53 has been a year of change for us, worse in anticipation than realization. It has brought our New York home and office within two blocks of each other, and of the Chemists' Club, as well as also close to Grand Central trains to Connecticut. Our Westport home has seen grand and great-grandchildren visiting, a great Spring flood and a drought in late Summer with a reparation-conscious bulldozer used to catch a 12″ trout. The latter may have inspired a fishing trip airborne a hundred and fifty miles north of the Saguenay.

The year has been generally one of closing ranks, better production facilities in Denver and Orillia, and continued improvement in internal operations. Major executive changes, consistent with our retirement plan, have gone through smoothly.

Many visitors from our European staff have been welcomed, and one executive from Amsterdam is here taking the Advanced Management Course at Harvard.

We are preparing for our 50th Anniversary of the invention of the Dorr Classifier in July 1954.

Wherever they are scattered, Dorrco staff, I know, join in good wishes to all friends worldwide.

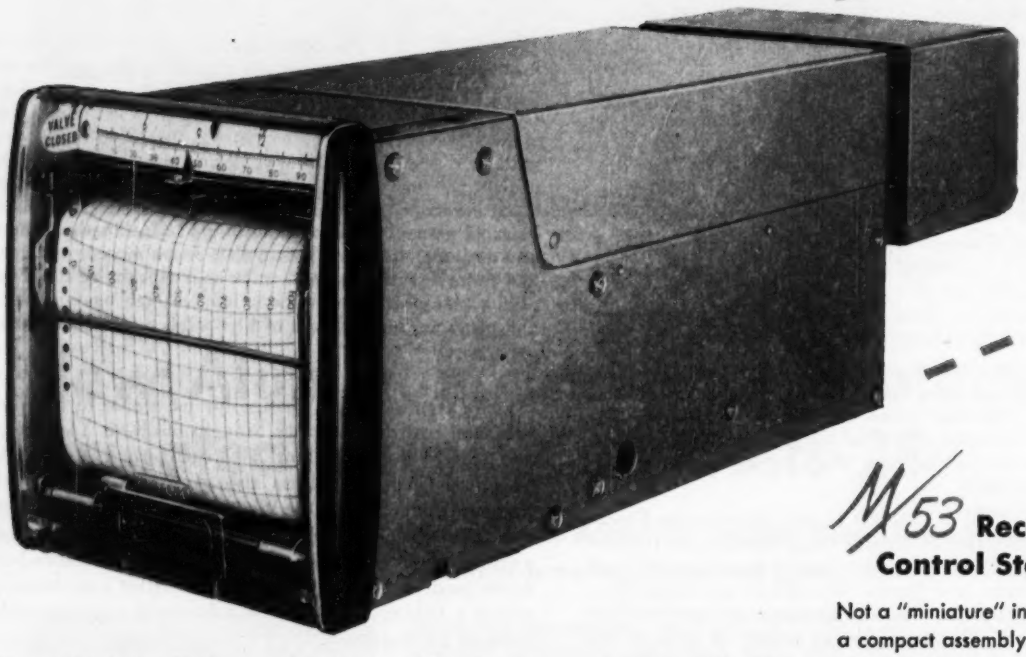


Barry Place, Stamford, Conn.

DORRCO

This exclusive Foxboro

outperforms any other Automatic Controller!



If you think this claim is exaggerated, just put a Foxboro M/58 Consotrol* Controller with M/53 Recorder on your process. The tougher the job, the more it will outperform other controllers!

Or ask any present user . . . many of the largest, most progressive petroleum and chemical processors are using hundreds of these instruments. They will unhesitatingly confirm that this Foxboro component system has put their processes "on stream", automatically and smoothly from the control room, without false starts or confusion.

This Consotrol Controller-Recorder system is an entirely different and original concept of instrumentation, developed through knowledge gained in Foxboro's 30 years of control leadership. The exclusive floating disc live-balance controller, and the full size 4"-chart recorder, are combined in an ultra-compact yet fully accessible 6" x 6" assembly. The result is unequalled ease of operation, repeatability of action, and uniform product quality.

Get complete facts on this remarkable advance in automatic control. Write for Bulletin 463, and ask your Foxboro representative for a demonstration.

*Reg. U. S. Pat. Off.

M/53 Recording Control Station

Not a "miniature" instrument, but a compact assembly of full-size component parts with no compromise in accuracy or convenience. *Features:* continuous valve position indicator . . . fast, no-drift control point setting plus micrometer adjustment . . . no external knobs . . . full 4" width, 30-day, easy-loading chart . . . several months' ink supply . . . single-switch automatic-manual transfer . . . additional measurement pen optional.

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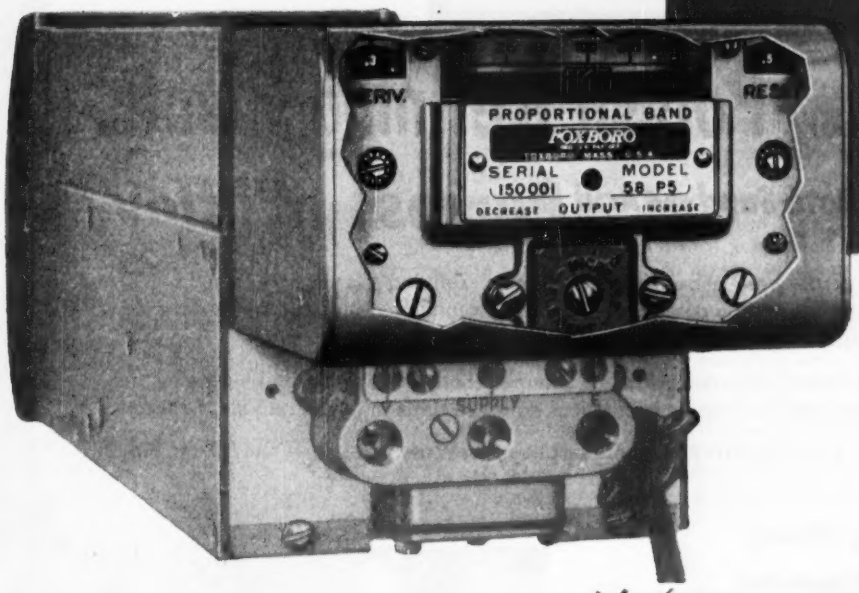
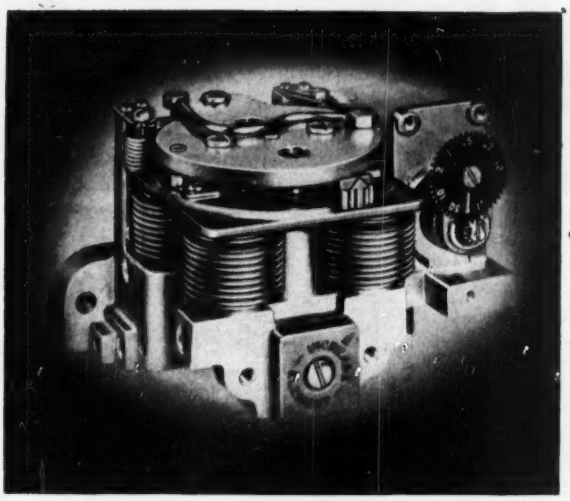
development



M/58 Controller

A remarkable design achievement, embodying the precision, sensitivity, and "live balance" of the exclusive floating disc. *Features:* no diaphragms . . . only one nozzle . . . only 19 parts . . . all four control functions available, including two ranges of reset . . . plug-in reset and derivative units. Can be integrally mounted with the M/53 as shown, or remotely located.



Revolutionary Design

Here's the high-precision Foxboro "floating disc" balancing system. Matched bellows provide stability and simplicity unapproached by other designs. Plug-in reset unit shown at right of assembly; derivative unit similarly plugs in at left. The lever-set proportional band adjustment is calibrated to 500%. This flexibility of function makes the M/58 adaptable to any process.

FACTORIES IN THE UNITED STATES, CANADA AND ENGLAND

CONSOTROL INSTRUMENTS

WILFLEY PUMPS

NEW Potash Refining Plants

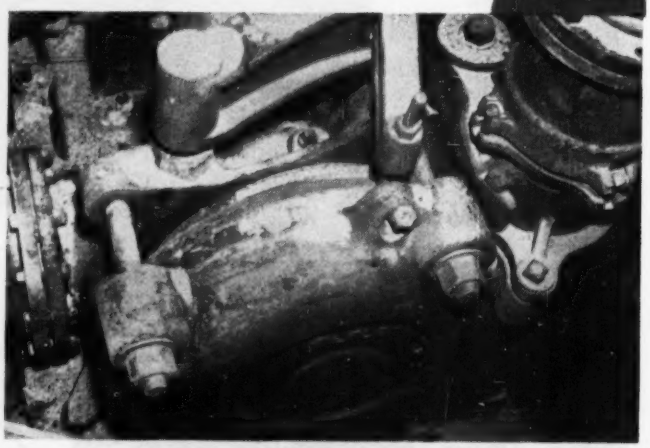
Feature Both Sand and Acid Pumps by Wilfley

Wilfley pumps were chosen for new potash refining plants in Carlsbad, New Mexico...for efficient, low cost production...for continuous, economical performance without attention.

Wherever installed, these famous pumps—*both* Sand and Acid—consistently increase production and create substantial dollar savings in power and maintenance.

Individual engineering on every application. Write, wire, or phone for complete details.

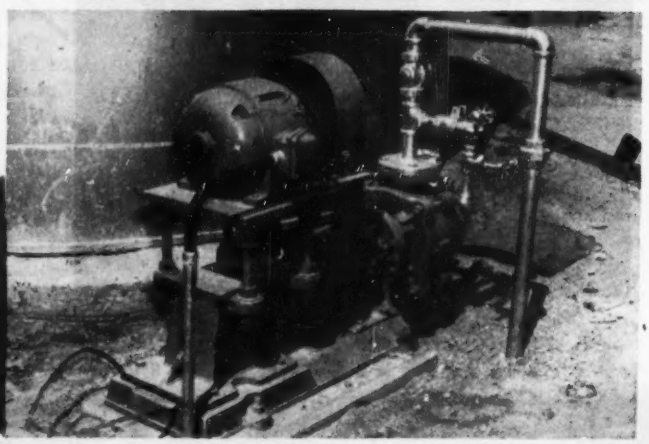
- **Cost-saving efficiency**
- **Stepped-up production**
- **Continuous operation without attention**
- **Minimum replacement of parts**
- **Designed for simple installation**
- **Economical pump size for every requirement**



Wilfley Sand Pump

"COMPANIONS IN ECONOMICAL OPERATION"

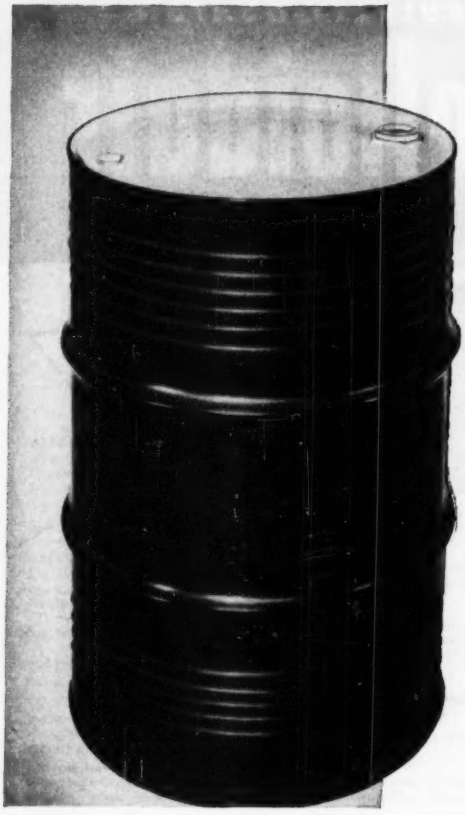
Wilfley Acid Pump



A. R. Wilfley & Sons, Inc.

DENVER, COLORADO, U.S.A. • New York Office: 122 East 42nd Street, New York City

Here's how and why U.S. Steel drums now provide greater product protection



●U. S. Steel Products has recently developed a cleaning and finishing process that eliminates a source of customer claims . . . product contamination. Through this new process, drums are now available which are free of all dirt, grease, scale and other residues which can contaminate your drummed product. In addition, the drums are fully inhibited against rust and corrosion which can also contaminate the drummed product and mar the exterior surface.

An important feature of the new U. S. Steel drum is that the rust-inhibiting phosphate coating is applied on an absolutely clean, scale-free surface . . . after the head, shell and bottom have been formed. This means a better drum for you because the phosphate coating completely covers all surfaces of the drum including the welded side seam . . . will not flake off when banged around . . . will effectively retard rust and corrosion on both the interior and exterior surfaces.

The thoroughly-cleaned, rust-inhibiting surface of the U. S. Steel drum permits the safe use of a wide variety of decorative finishes. Bright, contrasting colors may be used showing your name and trademark or slogan. The finish will last much longer because the phosphate coating and spray-painted surface insure longer life.

For the protection of the products you package and for longer lasting drums, be sure to get steel drums protected by the U. S. Steel process the next time you order.

UNITED STATES STEEL PRODUCTS fabricates Stainless, Galvanized, Tinned, Painted and Decorated drums and pails. Furnished in capacities from 2½ to 110 gallons, with a variety of fittings and openings to fit your particular requirements.

"It's Better to Ship in Steel"

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to meet pollution regulations

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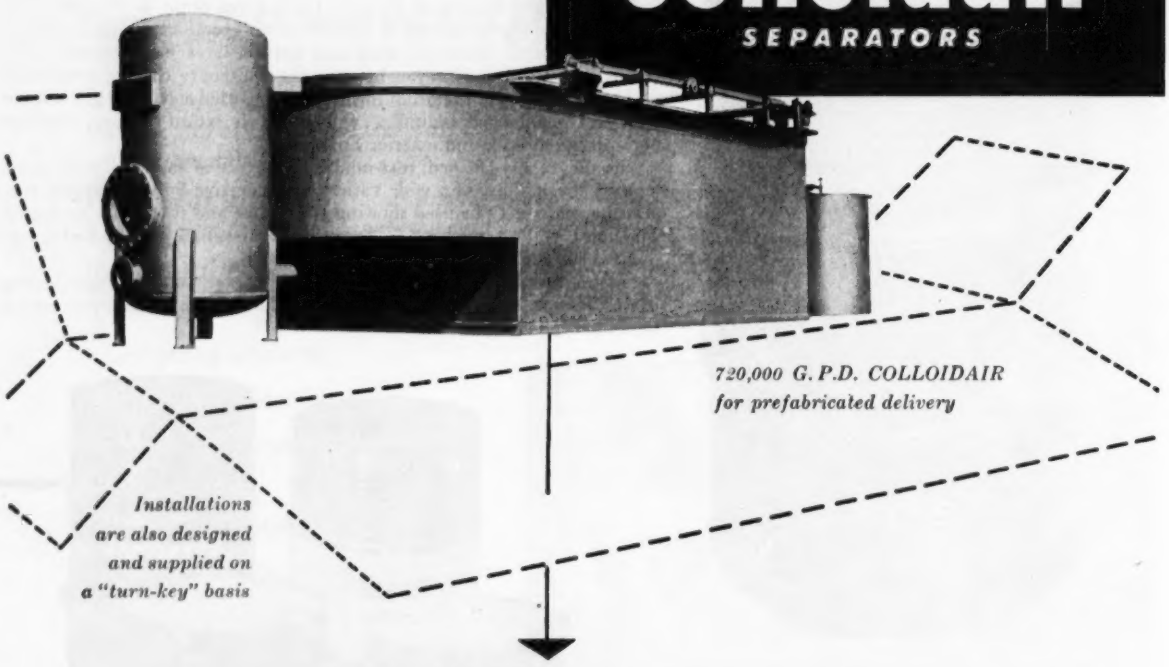

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This equipment meets state, regional, and local disposal requirements with...

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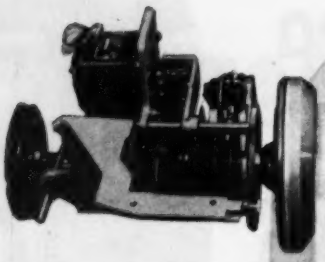
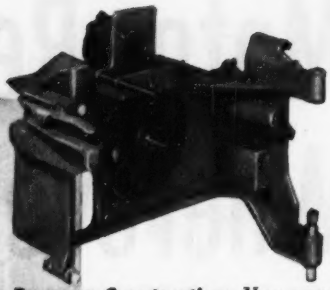
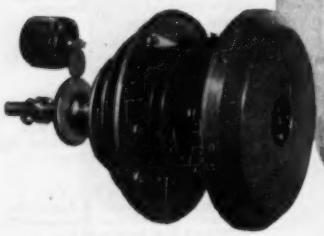
PUMPS — Integral types from ⅝ in. to 72 in. discharge and up.



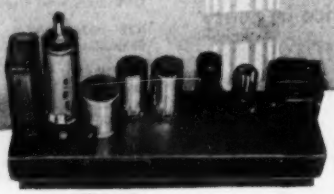
Reserve Power. Speedomax can operate at any speed from a whiz to a saunter, because balancing motors are two to four times more powerful than in any other present-day electronic controllers. A heavy load of control and signal cams makes no difference. The long Speedomax shaft and big case can accommodate a worlds-record assortment of such accessories.



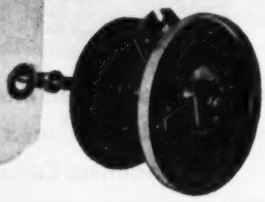
Reserve Construction. You may think all instruments are "delicate", until you look at a Speedomax. Then you'll see forgings and castings instead of stampings; cut, heat-treated gears instead of cast; ball bearings instead of sleeves. You'll see aluminum used, to save weight; parts made extra-strong to prevent deflections. You'll see, in detail after detail, how rigid construction gives rigid dependability.



Locked-in Synchronism. Synchronization of control, recording and signalling actions is permanently fixed because their actuating cams are locked on a common shaft. Obvious? Yes, but in this field a Speedomax exclusive.



Reserve Sensitivity. A change of one tenth of one percent of the range is picked up by Speedomax. The instrument therefore, never strains to keep its readings precise, even when the range is short.



Reserve "Cleanness" Speedomax has superb filtering and (when needed) shielding, but neither can guarantee that the electronic recorder's circuit will be unaffected by electronic "junk" from nearby motors, or other equipment. So, we provide a unique "clean" circuit design—and thereby cancel the junk that would otherwise slow down the balancing motor. Net effect is snappy and accurate recording action.

SPEEDOMAX® "Reserves"

ARE ALWAYS ON THE JOB!

● You get extra-fine performance, day-in and day-out, from Speedomax Recorders or Controllers because they are full of reserves to meet the "unusual" conditions which can and do come up so frequently. And these reserves of course give low maintenance as well as fine performance.

Why not inspect these evidences of quality the next time you need an automatic electronic potentiometer or bridge. See Catalog ND46(1) and (for circuitry) Tech. Pub. ND46(1). Address our nearest branch office, or 4916 Stenton Ave., Philadelphia 44, Pa.

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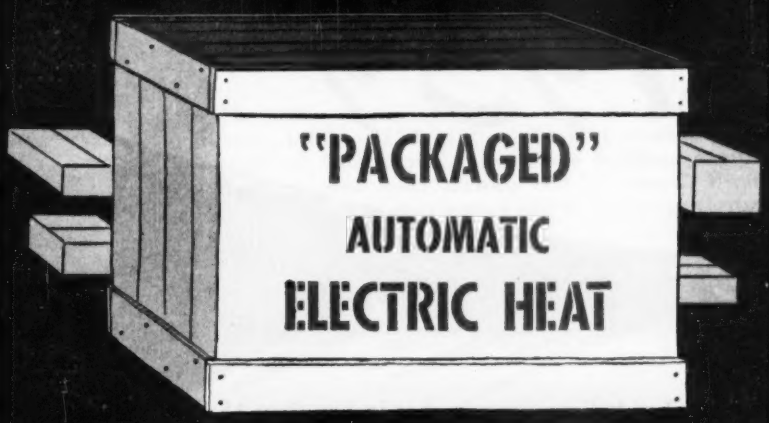
CHROMALOX



combining Heater and Thermostat in one unit

ready to go on your Jobs!

● CHROMALOX 'Packaged' Electric Heaters are ideal as permanent or portable heat sources in tanks, drums, process kettles and other containers. With CHROMALOX Heaters you can heat accurately and maintain the temperature of degreasing, cleaning, pickling and plating baths. You can melt greases, asphalt and similar viscous fluids. CHROMALOX Units may be had in the types, sizes and wattages required to efficiently do your heating jobs. They are available with sheaths of copper, stainless steel, alloy and lead for resisting the corrosive actions of the solutions you are using.

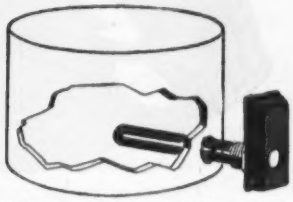
Nation-wide engineering service for on-the-job assistance and recommendations. Write, wire or phone for the name of the Chromalox Engineering Representative serving you.

CHROMALOX

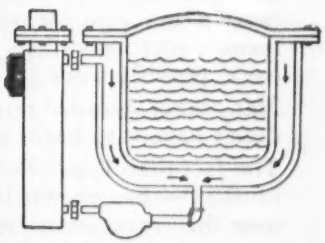
Electric Heat for Modern Industry

Variety and Versatility to fit your Needs Exactly

Chromalox Immersion Heaters with built-in thermostats for portable or permanent use. Drawing illustrates Immersion Units, equipped with sludge-legs, installed over the side of the tank for direct heating. Available in various metal sheaths to resist the corrosive action of the liquid compounds.



Compact, thermostatically controlled, screw-in type Chromalox Immersion Unit is easily installed in smaller tanks and other containers. Thermostat range is 100° to 180° F.



Chromalox Circulation Heaters give accurate, controlled heat up to 750° F. for heating Dowtherm, Aroclor or heat transfer oils. Other uses include water heating applications such as steam boilers and accumulators, kettles, tanks and processing equipment, preheating fuel oils, heating air, nitrogen and other gases; drying steam, plastic powders, etc.

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For complete details showing how to use Chromalox Heaters in your applications.

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What's happened to the more than 1,800 Corrosion-Resistant Coatings introduced

Since 1939

Hard to believe, isn't it, that in less than 15 years more than 1800 brand names of protective coatings have made their market appearance . . .

and disappearance.

Only a relatively few remain.

WHAT HAPPENED?

Many good coatings failed to last because their makers ballyhooed them too highly — practically forced corrosion engineers to use them under conditions where no coating could possibly work.

Many other so-called protective coatings just didn't have it to begin with.

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Second: we're not afraid to admit its limitations

Used as it should be used and under conditions for which it is suitable, Tygon Paint will outperform and outlast practically any coating on the market. Fifteen years have proved it.

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233-D

THE Chementator®

Prepared under the direction of Joseph A. O'Connor, News Editor

• The Office of Alien Property may soon dispose of its controlling interest in the $138 million General Aniline & Film Corp. The lawsuit of Interhandel, the Swiss holding company that claims ownership, has been thrown out of court. Even if Interhandel appeals, Congress may pass a bill to let the government sell anyway.

• Broadening its stake in the rocket business, Mathieson Chemical has sought to acquire up to half the stock of Reaction Motors, Inc., for $16 a share. The move brings the two firms closer together. Mathieson, through Matholin Corp., already produces hydrazine for rocket fuel.

Low-cost ethylene oxide via direct oxidation

Europe's only plant using direct oxidation is now producing ethylene oxide at L'Etang de Berre in France for Naphtachimie. Part of a big petrochemical venture costing $15 to $20 million, the ethylene oxide plant, designed and engineered by Scientific Design Co. of New York, has been running smoothly since its start-up. It has been exceeding design specifications, with yields well over 60 percent. The plant was designed to turn out 18 to 20 million pounds per year of ethylene oxide.

The direct oxidation process has significantly cut the cost of producing ethylene oxide—by more than the expected 25 percent. It surpasses in performance the chlorohydrin process, which Naphtachimie had originally planned to install. In fact, Scientific Design engineers, currently at work on a direct oxidation plant for Allied at Orange, Tex., doubt that any more chlorohydrin process plants will be built.

Allied's plant, the first in the U. S. using Scientific Design's direct oxidation process, will produce about 20 million pounds per year of ethylene oxide. It's slated to start operating early this year. Scientific Design is also handling the engineering work on Allied's glycol plant at Orange.

The French will use the ethylene oxide to make glycols, ethanolamines and glycol ethers. The plant of Naphtachimie at L'Etang de Berre, for which the ECA put up $855,000, is the only present petrochemical plant in France producing chemicals from ethylene. Naphtachimie is comprised of the Pechiney, Anglo-Iranian and Kulmann interests.

Unlike the chlorohydrin process, the direct oxidation method uses no chlorine. Instead, it simply oxidizes ethylene with air to produce essentially pure ethylene oxide. Oddly enough, it was a Frenchman, Lefort, who first developed a direct oxidation process almost two decades ago. Then, as a result of a U. S. court action, a Supreme Court decision opened the field. Now Scientific Design, having greatly improved the direct oxidation process by careful engineering and the use of a special silver catalyst, has achieved a method that it claims gives the highest yields at the lowest capital cost and the lowest cost of production. And the first plant is now operating in France.

New owner for Carthage Hydrocol?

Stanolind Oil & Gas Co., an affiliate of Indiana Standard, may step in and take over the Brownsville, Tex., plant of Carthage Hydrocol, pay off the $17.5 million still owed to RFC, and then pump an added $45 million into the plant. An agreement has been signed with RFC that may possibly lead to the acquisition of Carthage Hydrocol by Stanolind.

The plant of Carthage Hydrocol, which has been shut down since last June, was designed to produce synthetic liquid fuels and chemicals from natural gas. Stanolind has built a $14 million plant next to Hydrocol designed to use at least part of Hydrocol's daily output of 300,000 lb. of byproducts. Chemicals that can be produced include ethanol, acetic acid, acetone, acetaldehyde and others. Clearly, Stanolind's $14 million investment is at stake unless something is done about Carthage Hydrocol.

Earlier, a pair of stockholders had shied away from Stanolind's proposal. The two: Stone & Webster and Forest Oil Corp. Stone & Webster has $2.2 million invested; Forest Oil, $2.7 million. Another stockholder, United Gas, has already written off its $3.75 million stake as a complete loss. All told, close to $50 million has been sunk in Carthage Hydrocol, including the RFC loan. Of the 20 stockholders, Texaco is the largest with 48.82 percent of the common shares.

(*Continued on page* 106)

President E. F. Bullard of Stanolind and Guy G. Gabrielson, former Republican national chairman who now heads Carthage Hydrocol, have agreed that Stanolind can start looking over the plant and its processes immediately. Stanolind will also seek to extend Carthage's gas supply contracts. If Stanolind decides to take over Gabrielson's white elephant, the arrangement with RFC provides that Stanolind will acquire the stock and assume the obligations of Hydrocol.

Cyanamid boosting ammonia output

American Cyanamid will double capacity for production of anhydrous ammonia at its Fortier plant near New Orleans to more than 300 tons per day.

This $50 million plant for the production of nitrogen chemicals from natural gas is now under construction. It is strategically located for the marketing of anhydrous ammonia to producers of such crops as sugar, rice, cotton and corn—all grown in quantity in the rich agricultural areas in or near the delta of the Mississippi.

Anhydrous ammonia will also be used by the plant in the manufacture of other chemicals. The Fortier plant will manufacture ammonia, acetylene, hydrocyanic acid and derivatives of these, such as ammonium sulfate and acrylonitrile.

Flotation chemicals strike it rich

Largest market for chemicals in the production of metals, Dow's R. W. Forsythe told the CMRA at Pocono Manor, Pa., recently, is in ore dressing by froth flotation. The present world market for flotation collectors totals just under 30 million pounds per year, with an added 9 to 10 million pounds per year expected in the next five years. In North America alone, estimated annual consumption of modifiers for froth flotation is climbing toward 660 million pounds. And the world market for flotation frothers is now close to 25 million pounds per year, with the new water-soluble glycol ethers expected to open a new development market of about 9 million pounds within five years.

Froth flotation is by far the most efficient and economical process used in modern milling on most ores. Important metallic minerals being concentrated today by froth flotation are those containing copper, lead, zinc and nickel, with gold, silver and molybdenum as byproducts. These metals most commonly occur as sulfides, less often as oxides and only rarely as native metals—but always locked in worthless rock or gangue. Lead and zinc minerals are often found together and since they must be separated, as well as concentrated, for economic smelting, flotation performs a dual role.

Ore dressing involves: (1) breaking apart different minerals in the ore by crushing and grinding; and (2) separating valuable ore from the worthless gangue.

Over 95 percent of the world's copper comes from ores containing only about 1 percent copper, while smelting furnaces function most effectively when their feed has a copper concentration of 20 to 30 percent.

In concentrating a copper sulfide ore containing 1 percent copper, for example, to a concentrate containing 25 percent copper, the mined ore is first crushed, ground and classified. Then flotation chemicals, including collectors, modifiers and frothers, are added, and the aqueous slurry is conditioned. After conditioning, the pulp goes into flotation machines, where it's agitated in the presence of air bubbles. The mineral floats to the surface and is suspended in the froth, while the worthless gangue is removed and conveyed to a tailings dump. Froth from the surface is removed, dewatered and filter-dried for transportation to the smelter.

Collectors preferentially coat the mineral to be collected or floated, making the particles water-repellent. This improves contact between the mineral particles and the air bubbles. Modifiers are used to adjust the pH of the pulp, to oxidize the mineral surfaces where required, and to depress or activate further the mineral surfaces by methods other than oxidation. Frothers help to produce a stable froth that will support and carry away the mineral particles that have been floated to the surface on air bubbles. Together, collectors, modifiers and frothers comprise the trio of important flotation chemicals.

Collectors can be either anionic or cationic, with anionic collectors predominating in flotation of metallic minerals. Collectors are chemical specialties since most have little use except in flotation.

Most widely used anionic flotation collectors are the xanthates, reaction products of caustic soda or caustic potash, carbon bisulfide and an alcohol. The alcohols are usually ethyl through the hexyls. Another major class are the dithiophosphates, reaction products of phosphorus pentasulfide with caustic and various phenols, alcohols and mercaptans. Additional collectors include thiocarbanolid, thionocarbamates, dixanthogens produced by the oxidation of xanthates, and other organic sulfur compounds.

Thus the basic raw materials consumed in the production of anionic collectors are caustic soda, caustic potash, carbon bisulfide, phosphorus pentasulfide, phenol and alcohols with a two to six carbon chain.

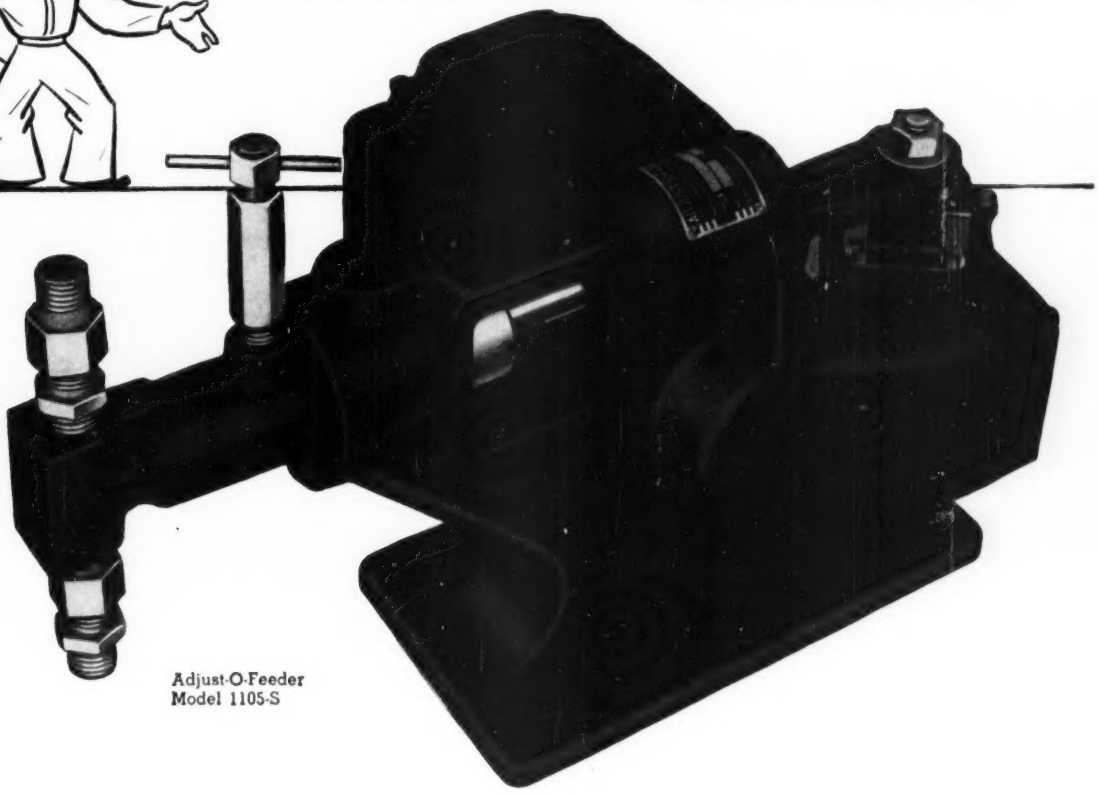
As modifiers, soda ash, lime, sulfuric acid and caustic soda are commonly used for adjusting pH; and chlorine, sulfur dioxide, copper sulfate, zinc sulfate and sodium cyanide for modifying and conditioning. Certain colloids, dextrins and starches are also used as depressants on a limited scale.

For frothers, the flotation industry first used pine oil and cresylic acid. Later came the amyl, hexyl and heptyl alcohols. And now Dow has introduced polypropylene methyl glycol ether, the first water-soluble frother.

(*Continued on page 110*)

NEW PROPORTIONING PUMP PACKAGE

FOR ADDITIVES OR CHEMICAL REAGENTS



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Model 1105-S

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  Built-in standard motor — no separate gearbox or couplings.
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- MICRO-STROKE ADJUSTMENT
  Scale easily read —crank and connecting rod operate in horizontal plane.
- LONG LIFE AND EASY MAINTENANCE
  One-piece Meehanite iron frame for positive alignment of all moving parts.
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This new, compact proportioning pump, by %Proportioneers, Inc.%, is inexpensive and meets most requirements for a low capacity, medium pressure chemical feed pump. The standard Model 1105-S has a capacity range from 1 to 10 GPH and will discharge against pressures up to 650 psig. For lower feeds, the unit is available with a range of from 0.5 to 5 GPH. Complete and self-contained, Model 1105-S weighs less than 100 lbs. and is ready to operate.

Ask for Bulletin 1105

% PROPORTIONEERS, INC. %

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From Incoming POWER to Operating POWER

Complete Electrical Distribution Equipment for Electrochemical and Electrothermal Industries

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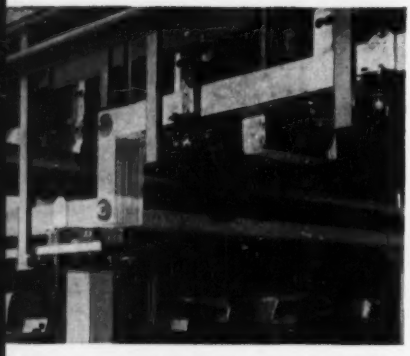
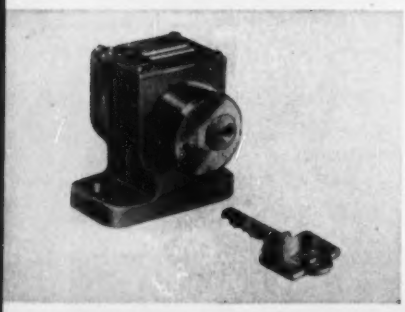
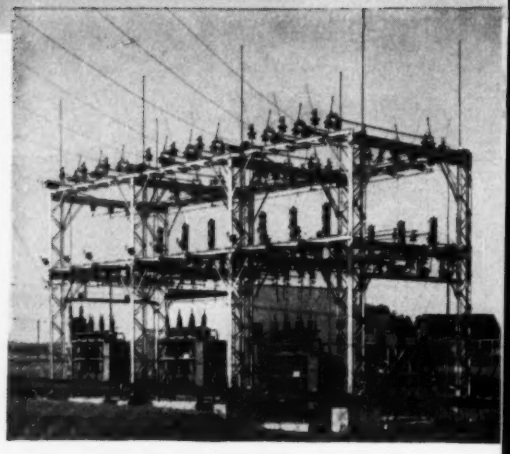
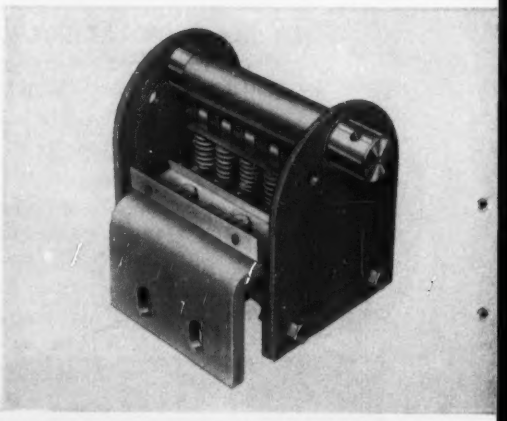
R&IE EQUIPMENT









For incoming power—SWITCHING EQUIPMENT and SUPPORTING STRUCTURES. Complete design and fabrication for bus supports, air switches, cutouts, and supporting structure.

For power feed to cells or furnaces—BUS DESIGN and FABRICATION. Engineering service, detailing, and complete fabrication. Ready to install.

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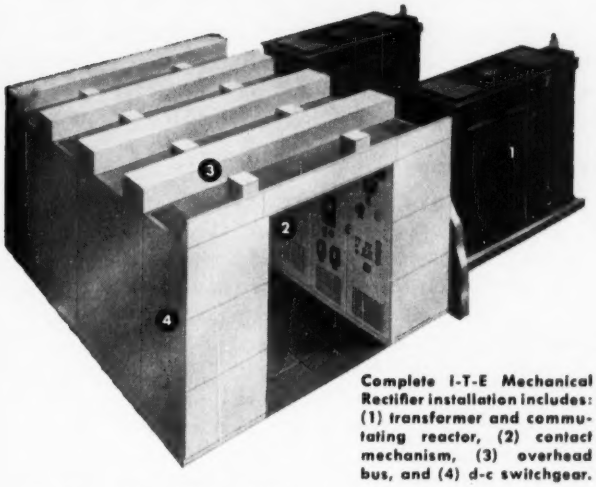

Complete I-T-E Mechanical Rectifier installation includes: (1) transformer and commutating reactor, (2) contact mechanism, (3) overhead bus, and (4) d-c switchgear.

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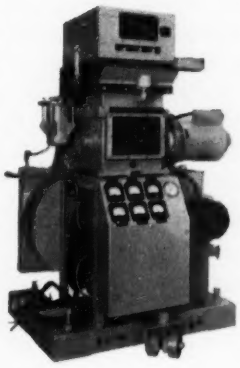
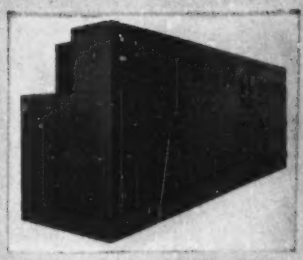


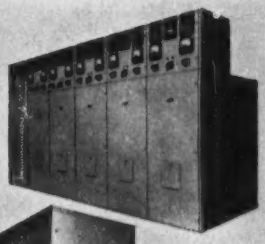
5,000-ampere contact mechanism. Multiple 5,000 and 10,000 ampere mechanisms are operable in parallel.

SWITCHGEAR



Unit Substations

For applications requiring primary or secondary types; indoor or outdoor installation; oil, askarel, or air transformers. Switchgear is of I-T-E metal-enclosed construction with drawout-mounted air circuit breakers.

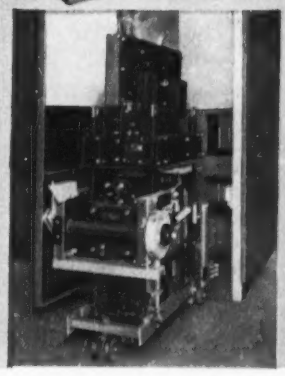


Metal-Clad Switchgear

For reliable protection, based on proved interrupting capacity, I-T-E provides factory-assembled and -tested switchgear, shipped as a unit, ready for low-cost installation. I-T-E air circuit breakers are horizontal-drawout mounted, featuring simplified disconnect and test with doors closed.

Low-Voltage Switchgear

For reliability and long life with reduced maintenance, I-T-E has metal-enclosed switchgear featuring pantograph, drawout air circuit breakers with complete range of ratings and widest selection of protective devices. Structures are exceptionally rugged and durably finished.



D-C Circuit Breakers

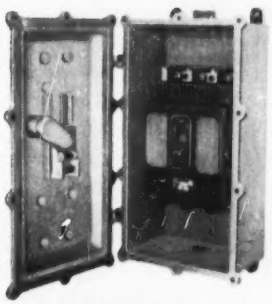
For interrupting heavy direct currents, as for protection of rotating machines and rectifiers, I-T-E provides specially-developed circuit breakers combining very rugged construction with fast circuit-opening and reliable arc extinction. Available auxiliary devices make these circuit breakers widely applicable.

Pullbox-mounted Urelite with all live parts enclosed for safety and dependable performance.

AIR CIRCUIT BREAKERS

LARGE and SMALL

For low-voltage applications, I-T-E offers a wide range of frame sizes, ratings, and tripping arrangements. Individually enclosed large air circuit breakers (Urelites) have the widest selection of trip devices and accessories. Molded case circuit breakers, available in four frame sizes, have dust-tight, vapor-tight, moisture-proof, or explosion-proof enclosures. All breakers are designed for easy application, accessibility, and trouble-free operation.



Molded Case Circuit Breaker in approved explosion-proof enclosure.

I-T-E CIRCUIT BREAKER COMPANY

Power Switching and Distribution Equipment

Circuit Breaker, Switchgear, and Rectifier Divisions, Philadelphia 30, Pa.

R&IE Equipment Division, Greensburg, Pa.

The market for flotation chemicals is bigger than it would seem at first glance. Thus collectors and frothers are each used in concentrations of 0.05 to 0.2 lb. per ton of crude ore milled, while modifiers are used in greater quantities. This concentration of 0.05 to 0.2 lb. per 8,000 lb. of pulp, after water has been added to the crude ore, may not seem a sizable market at first, but considering the tremendous tonnages milled, it soon adds up.

The present world market for collectors used in metallic flotation is about 29,900,000 lb. per year. The United States takes the biggest bite, 32.8 percent, followed by Canada, which consumes 16.7 percent. Canada's collector consumption is high because it produces close to 80 percent of the world's nickel. Central America, South America and the West Indies have a combined consumption of 14.7 percent. Europe and Asia together account for 13.7 percent. Africa is next, consuming another 13.7 percent, while Mexico takes 5 percent. Australia trails with 3.4 percent.

It's estimated that new mines, to be producing within five years, will increase collector consumption at flotation mills by 9 to 10 million pounds per year. Some of the larger new mining developments are in Upper Michigan, Arizona, Eastern Canada, South America and Africa.

Annual consumption of modifiers in North America alone reaches 659,250,000 lb. Lime accounts for 508,000,000 lb. of this total, soda ash for 74,000,000 lb., copper sulfate for 39,000,000, zinc sulfate for 29,000,000 and sodium cyanide for 9,250,000 lb. World consumption of these modifiers for metallic flotation is difficult to determine, and is less important to the U. S. chemical industry since most foreign countries produce their own. However, the total world market for sodium cyanide for metallic flotation is estimated as 13 million pounds per year.

The market for flotation frothers closely follows that for collectors. Estimated world consumption of frothers is 24,800,000 lb. per year. U. S. frother consumption is exceptionally high at 57.6 percent of the total because of the great tonnages of low-grade copper ore treated. South America is second with 12.5 percent, and Canada third with 11.7 percent. Europe and Asia together take 6.9 percent, while Africa consumes 6.1 and Mexico 5.2 percent. This breakdown of frother consumption is for metallic flotation only and includes pine oil, cresylic acid and alcohol frothers.

If more potent frothers, such as Dow's new water-soluble polypropylene methyl glycol ether, are used increasingly, the poundage consumed may drop while the dollar value of frothers marketed remains constant because of the higher price of the glycol ethers. A market of 9 million pounds is foreseen in five years.

The market for flotation chemicals is worldwide and is closely tied to world production of non-ferrous metals. In fact, chemical market trends can be predicted accurately from metal production trends. Because of forbidding transportation costs of crude ores, flotation mills are almost always located close to the mine. Thus flotation chemicals must be marketed in areas of the world where non-ferrous metals are mined.

Chemical venture would tap Utah gas

Utah Chemical Co., a Utah corporation of which Nicholas G. Morgan, Jr., a Salt Lake City businessman, is president, plans to build a $23.5 million chemical plant in south central Utah. The plant, according to Morgan, will produce fertilizer chemicals and some industrial chemicals. It will be one of the first large users of natural gas from the new Clear Creek field.

While a site hasn't been picked, one spot under consideration is at Nephi, where Thermoid Western now operates a plant. Other communities in the Sanpete Valley are known to be bidding for the plant.

Utah Chemical has filed an application for a 50 percent fast tax writeoff. The plant, which will employ 300, will produce anhydrous ammonia, urea, ammonium nitrate and nitric acid.

In addition to Utah natural gas, the plant may tap other resources of the region. Among them: phosphorus, coal and potash. Utah Chemical is reportedly drilling two shallow potash wells in the Paradox Basin.

From a basic trio, into fine chemicals

Lithium, bromine and boron are the trio of elements that will be exploited by American Potash & Chemical Corp. in its current diversification into fine chemicals for agriculture and industry. In addition to acquiring a new lithium source in Africa, American Potash & Chemical is intensifying research on the upgrading of chemical products, particularly those made from the brine of Searles Lake at its Trona, Calif., plant.

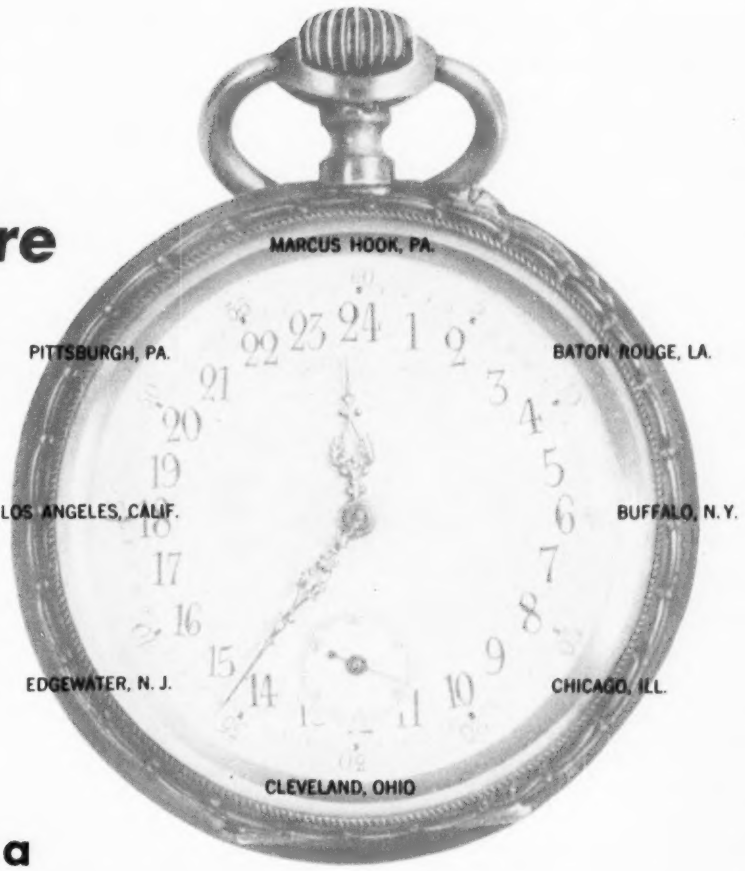
American Potash & Chemical has been producing lithium products at Trona for many years. For the past two years, as a result of its emphasis on upgrading of Trona products into fine chemicals, it has been converting crude lithium concentrates into lithium carbonate.

Now AP&C has completed arrangements to handle lepidolite and petalite ore mined from a large deposit of rich lithium minerals located near Fort Victoria in Southern Rhodesia. The mine is owned and will be operated by Bikita Minerals (Private) Ltd., under the management of Selection Trust, Ltd., a London mining organization with worldwide interests. American Potash & Chemical and American Metal Co., Ltd., are participating with Selection Trust in the financing and development of the venture.

Lepidolite and petalite are used primarily in the manufacture of specialty glass and ceramics, but have many other industrial uses.

(*Continued on page 112*)

You're just hours away



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FIRST IN FLUORIDES

Demand for lithium products has been increasing sharply, and they have been in short supply for some time. A tremendous growth is foreseen in the market for lithium salts in enamel frits, all-weather greases, air conditioning, specialty glass and other industrial uses.

Bromine is another basic element that can be converted into a wide range of chemical products. Many of these are now being turned out by the Eston Chemicals Division of American Potash.

Boron products have intriguing possibilities in the organic field, and American Potash is pushing research on these compounds. Research on borate esters has been the first step in an investigation of organo-boron compounds. Boron products can be used as intermediates in organic synthesis, as special solvents, fire-retardant components of plastics and coatings, water acceptors, adhesion promoters and heat transfer media.

American Potash has also done preliminary work on mixed anhydrides. Boron acetate has been furnished for test purposes.

From its basic position in boron, bromine and lithium, American Potash & Chemical is moving ahead via research into new commercial markets in fine chemicals.

New task for hydrazine

The strong reducing action of hydrazine has recently been put to a new use. A major producer of hydrochloric acid uses it to remove free chlorine in making C. P. muriatic acid. The new method has advantages over conventional methods of additional scrubbing or the use of antichlors other than hydrazine.

Hydrazine hydrate is added to the acid in the finished product storage tank or tank car in approximately stoichiometric proportion to the amount of free chlorine present. It combines with the chlorine to form hydrochloric acid and nitrogen. In the operation, chlorine-free acid is produced. The amount of chlorine removed approximates 50 ppm.

Mathieson Chemical Corp., now an important producer of hydrazine, believes the method will prove economical for removing considerably higher concentrations of chlorine and also for purifying aqueous solutions of other halogen acids. It's also expected that hydrazine will be used for purifying anhydrous halogen acids and other liquids and gases.

International steps up feldspar output

Its feldspar operations are being expanded by International Minerals & Chemical Corp. Three new plants are planned, and present equipment is being enlarged and modernized.

In southern Connecticut, where International holds large reserves of feldspar ore, diamond drilling has been completed. Plans are being drawn for a feldspar plant there. It will probably employ the LeBaron-Lawver dry beneficiation process, resulting in substantially lower production costs.

Diamond drilling is also under way at International's nepheline syenite deposits in southern Ontario. It's expected that a new mill for processing nepheline syenite will be built at Blue Mountain, Ontario, and should be in operation by mid-1954.

"These two new units in Connecticut and Ontario," says Vice President Norman J. Dunbeck, who heads International's industrial minerals operations, "are part of a long-range plan, and it is expected that a third large unit, a feldspar plant, will be constructed within about one year."

Meantime, International is enlarging and modernizing present equipment. Shovels, bulldozers and trucks are being replaced by new and larger units. Dust collecting and water clarification systems are being installed.

Flotation capacity at Spruce Pine, N. C., has been increased by 50 percent. New facilities for fine grinding have been installed at Erwin, Tenn.

The main laboratory for quality control at Kona, N. C., has been revamped and expanded. International has launched new feldspar research of its own, and has outside laboratories at work on similar research.

Strain gages control chemical processing

New strain gage techniques, first used to control production of pentaerythritol at the Mansfield, Mass., plant of Hercules Powder Co. and now used in other Hercules plants, can be adapted by many other chemical industries. These new electronic methods can be used to weigh materials, to control flow and level, and to control an actual reaction.

The mechanized quality control system now in use at Mansfield is unique. By using the strain cell method Hercules has achieved production of highly uniform pentaerythritol. All instruments used in the control system were manufactured by the Foxboro Co. of Foxboro, Mass., and by the Baldwin Lima Hamilton Co. of Eddystone, Pa. The strain gage is a precision instrument, extremely flexible in operation.

At the Mansfield plant, Hercules had earlier solved the problem of weighing and handling a flammable substance at a distance from its use by utilizing electronic equipment employing the electric strain cell. From this pioneering, the process has been improved so that today strain cells automatically control almost the entire Mansfield operation.

Use of strain gages, according to Hercules, has resulted in high reproducibility, constant control of delicate chemical operations and graphic records that have led to absolute uniformity. Hercules, already using strain cells in many of its other plants, foresees adaptation of this new technique to many processes.

(*What's Happening, turn to page* 114)

NOW . . . greater handling efficiency . . .
lower production costs . . .
WET SODA ASH STORAGE SYSTEMS
A number of manufacturers using soda ash in their operations are finding it profitable to store the material in solution or as a slurry. The wet systems provide greater ease of handling and substantial savings in installation and processing costs. In solution, a maximum of 3.3 pounds of soda ash per gallon of tank capacity may be stored; in slurry form, more than six pounds per gallon.
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products • sulphuric acid • ethylene glycols and oxide • methanol

What's Happening

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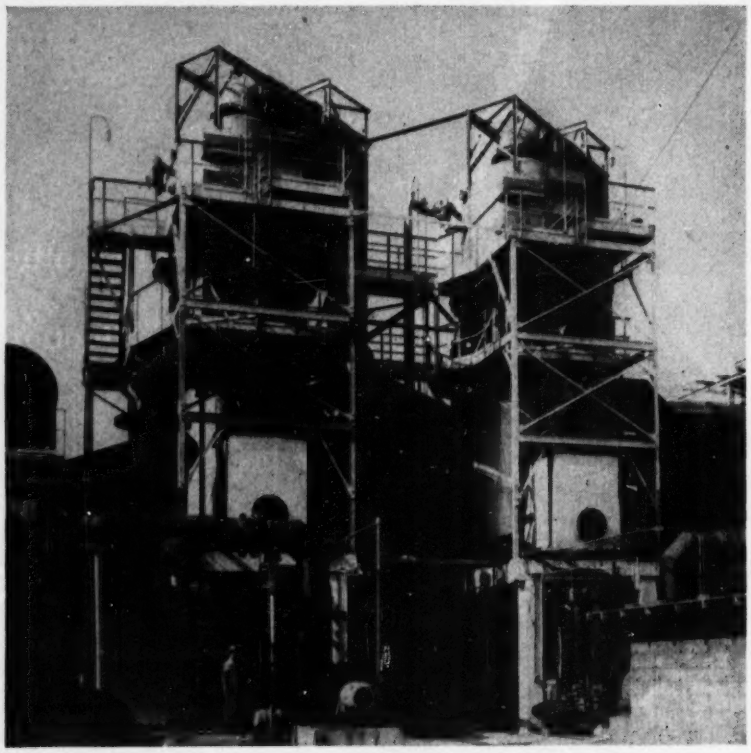
Alkylation Plant and Cat Cracker Improved

Extensive equipment improvements have been completed at Tide Water Associated Oil Co.'s Avon refinery at Associated, Calif., according to President D. T. Staples.

"Important additions have been made to the gas processing facilities of the fluid catalytic cracking plant," Staples says, "and also to the alkylation plant at Avon which will permit increased production of high-grade aviation gasolines for Army and Navy use and other products. They have been installed in order to capture and use more of the economically valuable gases given off during the manufacture of gasoline and other petroleum products."

The work done at the alkylation plant included improvement of its refrigeration system through installation of increased compressor capacity, extensions to its cooling tower equipment and the installation of a central refrigeration system. This work is expected to increase production of alkylate, a vital aviation gasoline component.

An existing absorber-demethanizer at the gas processing plant was replaced by a new primary absorber and a new deethanizer tower to increase the recovery of gaseous hydrocarbons from cracking operations.



THREE-PIECE scrubbers clean and cool the gases from the sludge furnaces.

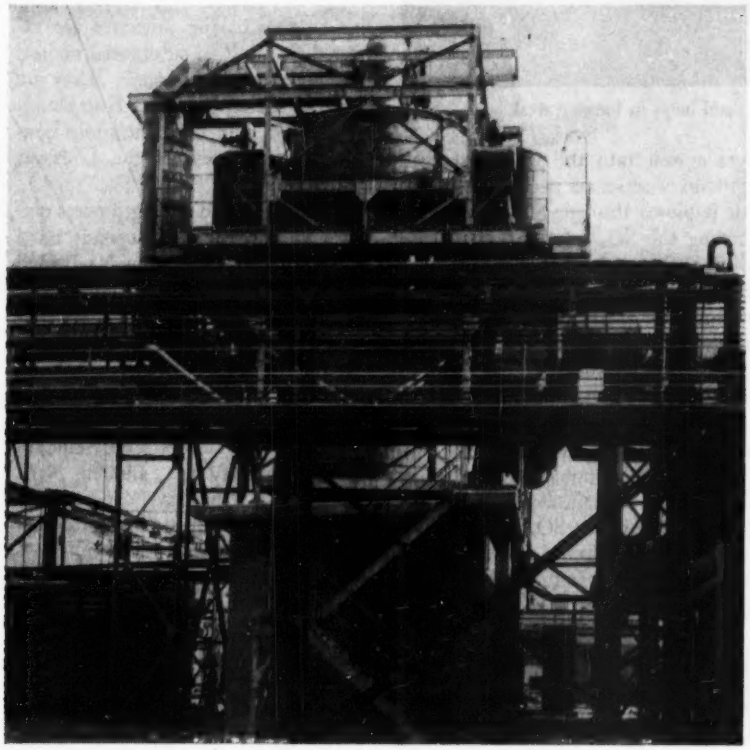
New Acid From Refinery Sludge

Modern plant converts dirty spent-acid sludges, from a variety of refinery sources, to clean 98-percent sulfuric acid at a rate of 400 tons per day.

Consolidated Chemical Industries has recently put into operation at Baton Rouge, La., a new $3.5-million contact sulfuric acid plant designed to produce clean, white acid from a variety of petroleum refinery spent-acid sludges. Design capacity of the plant, which consists of two parallel units, is 400 tons per day as 98 percent acid.

The new plant can handle sludges with acid contents as low as 65 percent, extending greatly the usefulness of this type of process in the recovery of refinery wastes. Previously, sludges of less than 82 percent acid content could not be successfully handled.

Over-all efficiency of the plant from spent acid to new acid is approxi-



ELECTROSTATIC precipitators remove entrained acid mist from scrubbed gases.

mately 94 percent. Efficiency of the converters (SO_2 to SO_3) is about 98 percent. Three men per shift operate the two units.

▶ **Variety of Sludges**—Some spent-acid sludges are from alkylation operations, others from the production of lube oils, benzene, alcohols and other products. Still others are blends of sludge from two or more of these operations. The accompanying table shows the compositions in use at the time CE's editor visited the plant.

Handling, blending and preparation of the many different sludges has been one of CCI's major operating problems. The sludges come into the plant from several refineries in the area via railway tankcars and barges. Those containing 50 percent or more water are stored in brick-lined tanks; stronger sludges are kept in steel tanks.

The various sludges are blended by pumping through high-silicon iron mixers. Control of the composition and viscosity of the sludge fed to the acid plant is done by analyses and by varying the flow of sludge from each storage tank.

Typical Compositions of Spent-Acid Sludges

Source	% H_2SO_4	% H_2O	% Hydrocarbon
Alkylation	87	3	10
Oil	65	10	25
Alcohol	58	32	10
Lube oil	48	50.6	1.4
Benzene	60	7	33
Alcohol	65	34	1

▶ **Process Highlights**—The new plant uses the basic Chemico process, plus several innovations in equipment and procedure introduced by Consolidated.

The blended spent-acid sludges are sprayed into a combustion furnace, where they decompose to produce SO_2, steam and oxygen. Some of the heat needed for the decomposition comes from combustion of the hydrocarbons in the sludge. The rest is provided at present by burning natural gas in the furnace. Eventually, however, the amount of supplementary fuel will be greatly reduced by providing a recuperator which will preheat the combustion air via heat exchange with the hot gases leaving the furnace.

The gases from the furnace pass through a settling chamber to drop out ash and other solids, and then through a Peabody scrubber, where the gases are further cleaned and cooled. Next in line is a drying tower, where the gases are dried by 93 percent acid.

Dried gases are picked up by a blower and sent to a converter system, where the SO_2 is oxidized to SO_3 in the presence of vanadium catalyst. The incoming gases are heated to the required temperature for the reaction by heat exchange with the gases leaving the converters. The exit gases are scrubbed with strong acid in an absorption tower to produce 98-99 percent H_2SO_4.

The SO_2 content of the gases fed to the converter system is, of course, dependent upon the strength of the spent-acid sludge burned in the furnace. If the gas is too weak in SO_2, insufficient heat is liberated in the converters to make the reaction self-supporting. CCI overcomes this difficulty by boosting the gas temperature in an auxiliary furnace.

▶ **Acid-Water Balance**—The scrubber is designed to cool the gases to as low as 80 deg. F. by direct contact with 72-deg. well water. Since the cooled

AUXILIARY furnace supplies heat for start-up and helps in burning weak acids.

gases are saturated with water vapor, their temperature controls the volume of water they carry to the drying tower. This in turn determines the strength of the acid which can be produced or the quantity of weak acid which can be fortified to a given strength.

Based on a normal sludge strength of 78 percent and a scrubber exit temperature of 80 deg., the plant could make its rated 400 daily tons as 20 percent oleum. However, since facilities for production of oleum are not provided, the plant can take on sludges much weaker than 78 percent or, if so desired, can cut back on cooling water so that the cooled gases leaves the scrubber at temperatures as high as 95 deg. At this temperature the water content of the gases corresponds to an acid make of 98 percent concentration.

▶ **Scrubber Details**—The Peabody scrubbers are built in three sections. The top section is made of stainless steel and serves as a gas cooler. The middle section is brick and lead construction; this is where the furnace gases enter the scrubber and are humidified. The bottom section, the stripper, is made of Haveg.*

Cold water enters the top of the cooling section and flows over a series of four perforated plates through which the gases rise. Intimate contact of gases and water permits a close approach between inlet water and cooled gas temperatures.

Water leaving the cooling section is pumped to sprays at the top of the humidifying section, finally flowing over a weir into the stripper, which contains a series of perforated plates. Air is blown through the stripper, removing the SO_2 from the water and joining the main gas stream in the middle section.

▶ **Converter Heat Balance**—Each unit uses two converters in series, with the gases flowing from top to bottom through several layers of catalyst mass.

Percentage of SO_2 in the inlet gas affects the temperature rise in the converters and also influences control of the unit. To maintain a reasonable production rate the SO_2 content must normally be between 6 and 8 percent. This restricts the composition of the sludge that can be burned.

Consolidated, however, has been able to operate its converter system on gas strengths as low as 4.8 percent SO_2. A battery of three heat exchangers makes this possible. The SO_2 leaving the blower passes through the shells of the three exchangers in series on its way to the primary converter. Gases leaving the primary converter pass through the tubes of the third exchanger on their way to the secondary converter. Gases leaving the secondary converter pass through the tubes of the first and second exchangers, in counterflow to the incoming gas from the blower, on their way to the absorption tower.

▶ **Auxiliary Furnace**—Another feature of the contact section of the plant is the gas-fired auxiliary furnace. This serves two purposes. It can be used to heat the catalyst to proper temperature for initial start-up of the plant.

Also, as suggested above, it permits the use of weak spent acid when such acid must be disposed of by burning. To do this a portion of the SO_2 gases leaving the primary heat exchangers is diverted by dampers to pass through the shell side of the furnace, where it is heated by combustion products passing through the tubes. It is returned to mix with the balance of the gases at the entrance to the converter heat exchanger.

* In a previous installation a similar stripper was built of stainless steel, but it failed after two years and was replaced by a Haveg stripper. All lines handling water containing SO_2 are also of Haveg.

Improved Coking Processes To Slash Refining Costs

Two new coking processes are expected to result in substantial savings in petroleum refining costs. They are the fluid coking process of Esso Standard Oil Co. and the continuous contact coking process of the Lummus Co.

Esso's new fluid coking process employs no catalyst, but depends on a circulating stream of finely divided coke particles to furnish the heat for the coking reaction.

"No periodic shutdowns for removal of coke are required," according to A. Voorhies, Jr., of Esso Standard Oil Co., Baton Rouge, La., and H. Z. Martin of Esso Laboratories, Standard Oil Development Co., Linden, N. J. "The reactor," they say, "can be maintained continuously at the desired operating conditions."

During recent years there has been considerable incentive for upgrading residual stocks because of the spread in price between crude and fuel oil, according to Voorhies and Martin.

Although coking processes have been used since the earliest thermal cracking of petroleum, it has always been necessary to shut down for removal of coke. The new fluid coking process remedies this situation at a lower operating cost.

Outstanding feature of the Lummus process is its ability to handle feedstocks much heavier than can be processed normally by conventional delayed coking, according to Valentine Mekler, A. H. Schutte and T. T. Whipple, all of the Lummus Co.

"The industry today requires, and in the future will require, higher yields of middle distillate," they say. "The Lummus process provides a new tool to assist in meeting this requirement."

The Lummus system is continuous, thus eliminating the intermittent cleaning of coke drums and attendant expense. Capital investment and op-

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Your Shell Chemical representative will be glad to discuss your alcohol supply problem with you, at your convenience. You are invited to telephone or write.

*Tank truck and drum availability west of Rocky Mountains is limited.

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erating labor costs for a contact unit are less than for a delayed coking unit.

"Compared with delayed coking," the Lummus engineers point out, "the yields from contact coking show considerably lower coke production with higher gas and gasoline yields."

Triple Super Production Starts in Utah Plant

Production of fertilizer at the new $5 million plant of Western Phosphates, Inc., at Garfield, Utah, is just getting under way. The plant's output for the first six months is "completely committed," according to Vice President John P. Jones.

The plant can produce 90,000 tons of phosphate chemicals annually, mostly triple superphosphate. The triple super will be made by combining Wyoming phosphate ore with sulfuric acid from the nearby plant of Garfield Chemical & Manufacturing Co.

In addition, a "substantial amount" of nitrogen-phosphate fertilizer (11-48 ammonium phosphate) will be produced. The ammonia for this product will be imported. However, two firms are contemplating construction of ammonia facilities in Utah.

Production of the firm's third product, phosphoric acid, will be "small," according to Jones.

Ninety workers will be required for production operations. When the Garfield plant of Western Phosphates was first planned, output was set at 60,000 tons. The boost to 90,000 tons reflects increased interest in the newer nitrogenous fertilizers.

Backers Propose to Build Ammonia Plant in Utah

Plans for a multi-million dollar anhydrous ammonia plant in Salt Lake City are being made by the newly formed Salt Lake Chemical Co. Target date for plant operations reportedly is sometime in 1955.

First known as Mill Creek Chemical Co., the newly formed company is being pushed by Tears Engineering Co. and Henry C. Beck Co., both of Dallas, Tex., and Glore, Forgan & Co., New York investment banking firm, reportedly is furnishing financial backing.

However, the identities of prospective owners and operators have not been disclosed. While no allocation of natural gas has been made by Mountain Fuel Supply Co., it's believed some 7 million cubic feet of gas would be available for the project by 1955.

Revamped Mill Resumes Manganese Production

New mill of Manganese, Inc., near Henderson, Nev., is expected to get into operation during January 1954. Of steel construction, it will replace the original structure of wood. The original mill was destroyed by fire in June 1953.

The flotation and grinding plant has been completely redesigned by engineers of Manganese, Inc. It will incorporate many new features to speed production.

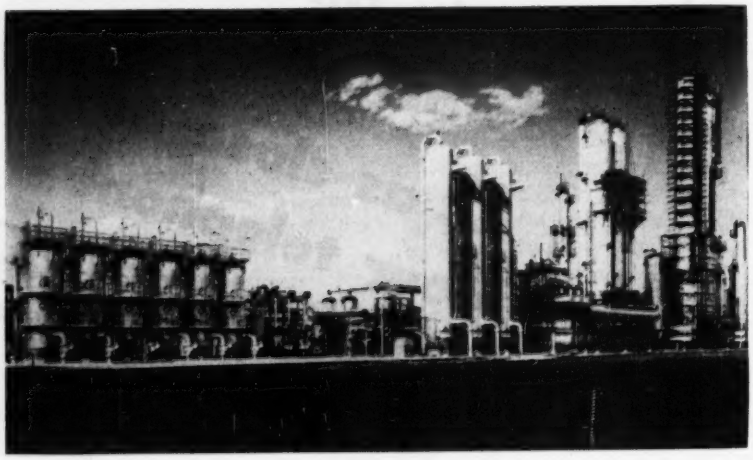
Capacity of the plant will be 1,200 long tons per day. It will include these new features: cyclone classification, multi-cell conditioning and five-stage cleaning instead of four-stage. The ore bins and conveyor way, destroyed by fire, will be replaced by all-steel construction.

During the shutdown, the company added a new lead fume recovery unit to the kiln. The recovery unit consists of two wet cyclonic scrubbers. It has a 70,000-ft. hot induced draft pan.

Initially, the modified kiln will get back into operation by using concentrates that the company has in storage.

With the completion of machinery installation and building erection, the mill is expected to resume operations in January. This is ahead of the original timetable.

Mining and stripping at the Three Kids mine near Henderson, which supplies the raw ore, will be done by Isbell Construction Co. Thus Manganese, Inc., expects these improvements to result in more efficient operation of its new manganese mill.



A Petrochemical Plant Arises

Silhouetted against the sky, these shining new dehydrators, light and heavy oil absorption towers and heavy oil stills stand ready for operation at the Tuscola, Ill., plant of National Petro-Chemicals Corp. Together, they comprise an extraction unit that will remove heavy hydrocarbons from 400 million cubic feet of natural gas each day.

The new $50 million plant, which produces propane, butanes, natural gasoline and industrial chemicals, is owned 60 percent by National Distillers Products Corp. and 40 percent by Panhandle Eastern Pipe Line Co. The plant has seven major producing units, two of which are wholly owned by National Distillers.

Products will include 125,000 gal. a day of 192-proof synthetic ethyl alcohol, and yearly output of 200 million pounds of ethylene, 50,000 tons of ammonia and 140,000 tons of sulfuric acid.

Another site at Tuscola is now being cleared by National Petro for construction of a plant to produce initially 25 million pounds per year of polyethylene.

OPERATING COSTS... AND PLANT LOCATION

The ability of a company to make and maintain cost reduction is especially significant now that vigorous competition and a buyers' market are back.

Shrewd selections of plant locations that take advantage of new developments, available manpower, transportation, low-cost power and material handling, can well mean the difference in a healthy profit or a ruinous loss.

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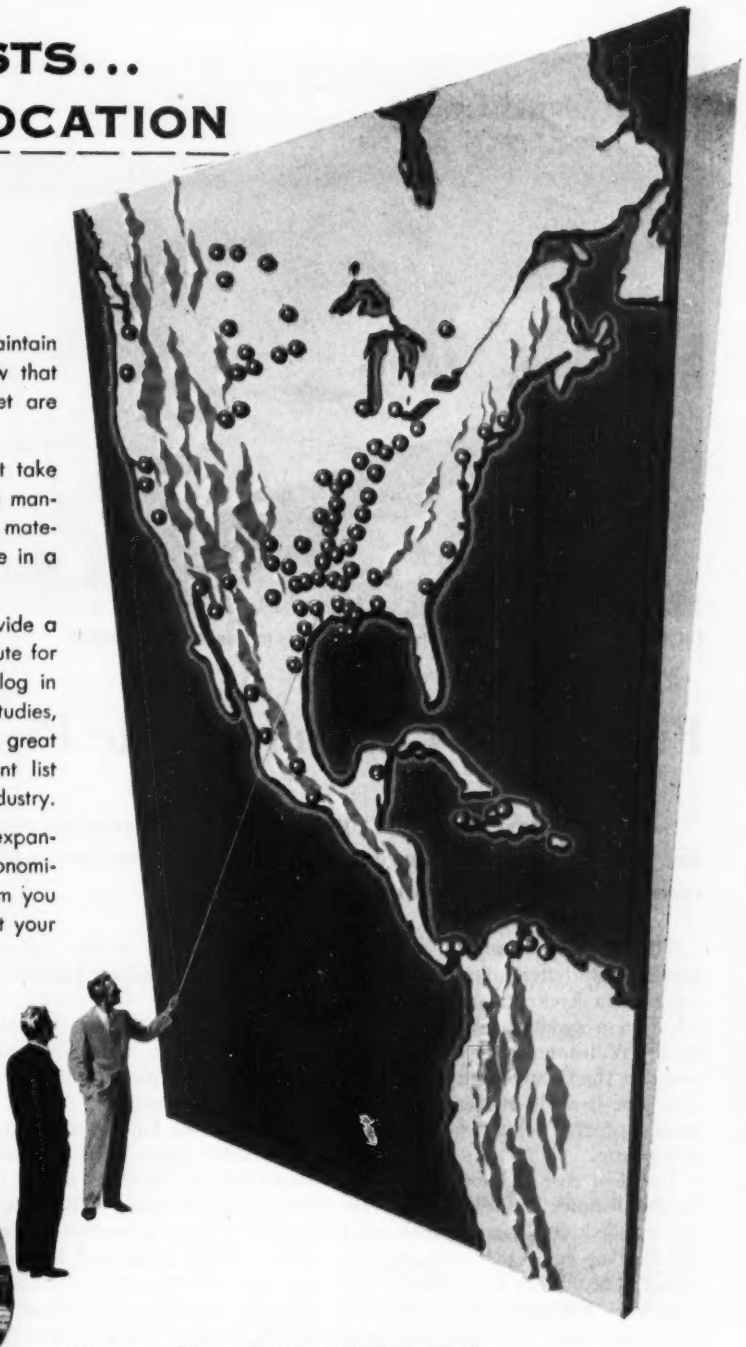
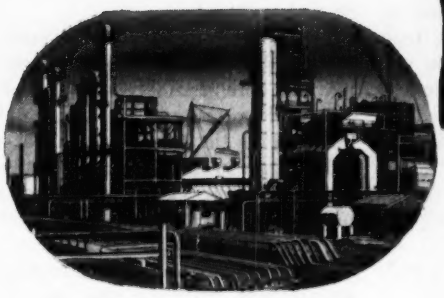
If you are planning new construction or expansion, Brown & Root's experience in fast, economical completion can benefit you. A call from you will put Brown & Root's planning experts at your disposal. No obligation, of course.





A large part of Brown & Root's activity has centered around the process industries in the design and construction of plants for heavy chemical, petroleum, petro-chemical and organic chemical fields.

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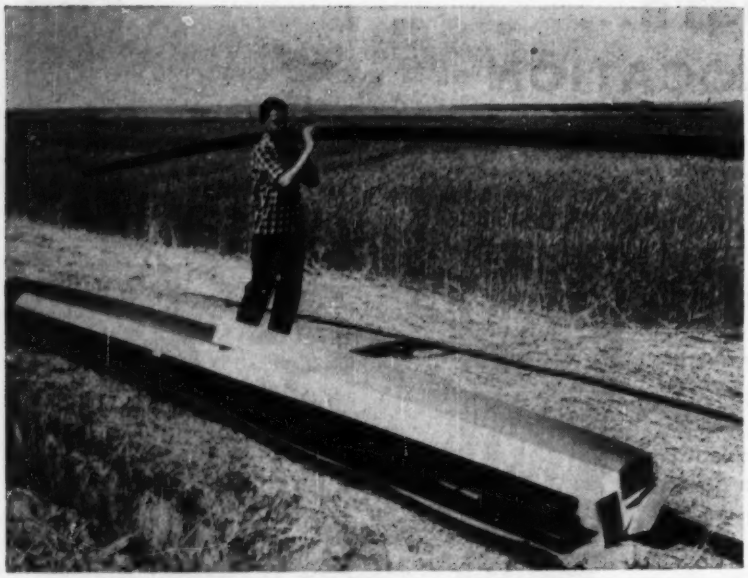
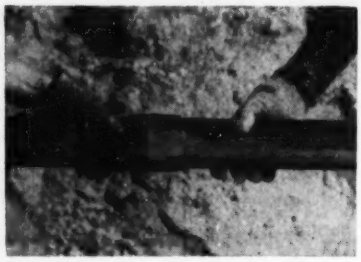


LIGHT WEIGHT of plastic pipe makes it easy-to-handle, easy-to-install.

THINNER prepares surface for cement.



JOINTS can be made in minutes.

First Cross-Country Plastic Pipeline in Service

Low first cost, low operating costs, corrosion resistant and no paraffin clogging. These are the features of the country's newest and longest plastic pipeline.

The country's longest all-plastic pipeline—nearly ten miles of 3-in. pipe—is now in service transporting crude oil from a producing field in Montana's Williston Basin to a loading point on the Great Northern Railway. The pipe is made of Tenite II, Tennesee Eastman's cellulose acetate butyrate plastic.

Low first cost and low upkeep are the big features of the new line. Total installed costs ran a little over $75,000, as compared with an estimated $100,000 for a comparable size steel line. Although plastic pipe costs more than steel pipe, this was more than offset by reduced labor costs.

▶ **Speedy Installation**—Two men and a boy laid the entire 52,300-ft. line in only five days. The total crew—including ditching and covering—was only six men.

Since a 20-ft. section of 3-in. Tenite pipe weighs only 13 lb., compared with 153 lb. for a similar section of steel pipe, there was no weight problem. Heavy equipment for pipe handling, such a welding machine or boom-equipped trucks, were not needed. Where a section had to be cut to fit, an ordinary handsaw was used.

Sections were joined by plastic couplings. These were attached by breaking up the plastic surface with a thinner and cementing.

▶ **How It Was Laid**—A conventional rotary ditch-digger with a speed of about 800 to 1,000 ft. per hr. took care of the ditching. The pipe was joined to form a continuous length while on the bank, and lowered by one man into the trench. To allow for the high expansion and contraction of Tenite, it was "snaked" through the ditch, so that it touched alternate sides of the ditch every 200 ft.

The trench was refilled by a bulldozer.

So swiftly was the operation performed that no road crossed by the line was closed for more than 30 min. while the trench was dug and the pipe laid.

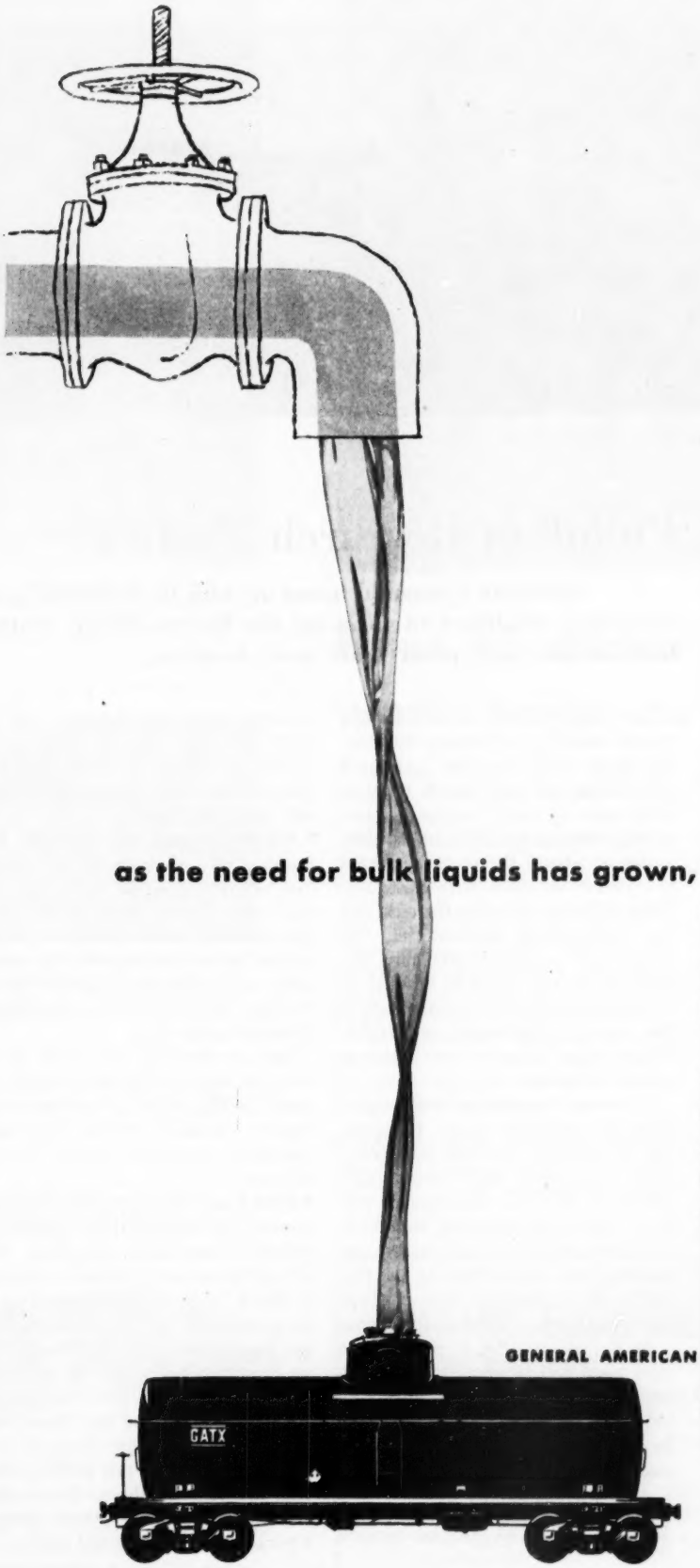
▶ **Inexpensive Operation**—Designed to operate at a maximum pressure of 90 psi. at a temperature of 60 deg. F., the line is planned to deliver 2,500 bbl. per day, with facilities for increasing the capacity in the future. Because of the smooth interior surface of the extruded butyrate pipe, friction encountered by the oil is less than would be found in a steel pipe. This means a higher flow rate and a lower power consumption.

Three 7.5 hp.electric pumps, each capable of operating against a head of 78 psi., have been installed along the line. Pumping costs are estimated at only a fraction of the cost of pumping through a steel line.

In addition to lower operating costs, the installation of three smaller pumps provides both flexibility and dependability of operations. Spares are not necessary for the line can operate at a reduced rate in the event one pump is down for repairs. Further, total cost of the three pumps was less than one high pressure pump.

▶ **Cuts Maintenance**—Anticipated maintenance costs are also low because, unlike steel, Tenite resists the corroding of the high-paraffin and high-sulfur content crude oil. Paraffin clogging—necessitating frequent scraping of steel lines—also gives no trouble with Tenite.

This is because the wall surface of the plastic pipe is much smoother than steel.



as the need for bulk liquids has grown, new GATX tank cars have been designed, built and operated by General American

The GATX fleet of 45,000 tank cars contains more than 200 specialized types to meet the needs of bulk liquids shippers.

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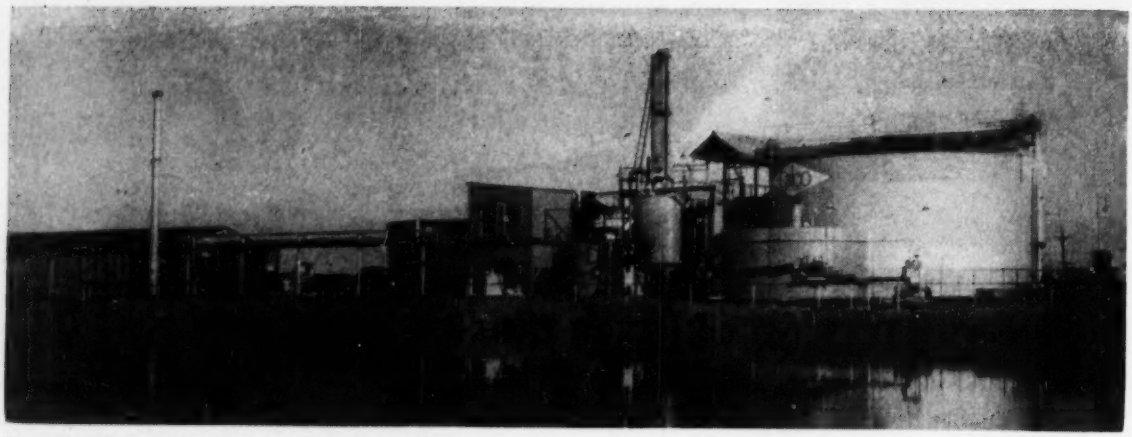
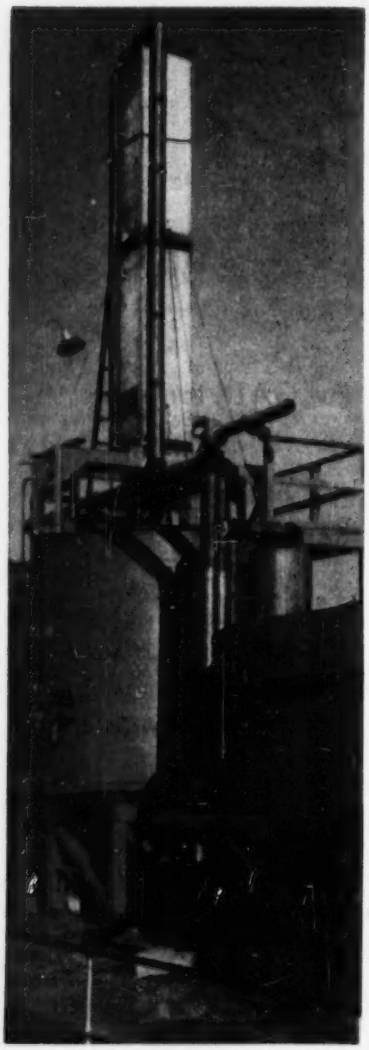


New pilot plant can be seen in front of the existing effluent plant.



Degasification, oxidation, and settling start here. Then effluent discharges to a sludge-blanket settling tank.

Pollution Research Pushed

American Cyanamid teams up with its industrial and municipal neighbors to clean up the Raritan River. Pollution control pilot plant must meet deadline.

The chips are down in New Jersey's present campaign to clean up the Raritan River. And American Cyanamid Co., within the next twelve months, must come up with a successful process for reducing the BOD of its plant wastes at Bound Brook or be forced to curtail its activities there drastically. Other industrial plants in the area, and the surrounding communities, are faced with a similar problem. The water in the river must be cleaned up to meet the statutory requirements of the state's Department of Health. What's more, there's a court action to enforce diligence.

Cyanamid has set up a new pilot plant for economic study. Its operation is supervised carefully by a plant-wide committee that meets each month to plan the development program. Optimum operating conditions are being established and each manufacturing area is investigating the possibility of recycling and recovering certain ingredients of their waste streams.

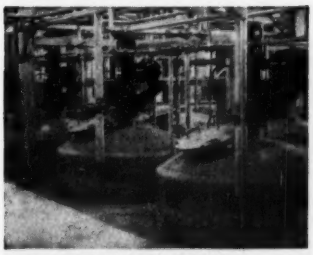
By the end of 1954, it is hoped, the pilot plant will be successful in treating most of the contaminants. Cyanides may be a headache, but they will be tackled also. Allowing about six months for design, a new $7,000,000* pollution abatement project will be built, scaled-up from the pilot plant results. A site for the new plant has been selected near the present Cyanamid treatment station.

*This figure includes the cost of providing "compensating water" to replace whatever flow is diverted for pollution control.

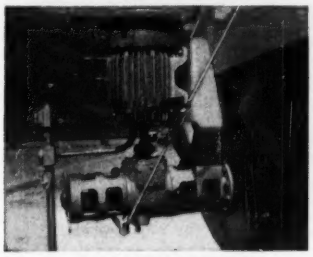
▶ **What's Needed**—Wastes from the various processes involved in making dyestuffs are predominantly on the acid side. For a number of years, Cyanamid has been neutralizing these wastes before discharge to the river, using as a convenient source of alkali the basic waters from the neighboring Johns-Manville plant.

But no effort has been made to reduce the high biochemical oxygen demand (BOD) which is characteristic of organic chemical wastes. The new process is intended to correct this deficiency.

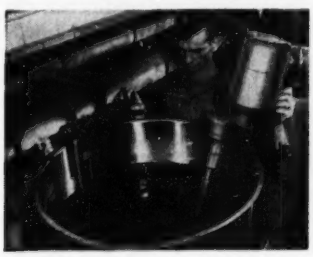
▶ **Pilot Unit**—The new pilot plant has been set up alongside of Cyanamid's present effluent treatment plant. The pH of the incoming stream is adjusted to about 7.5 by automatic metering of lime solution. After, neutralization the new process calls for blowing air up through a falling-film of waste liquid. Both oxidation and CO_2 removal are accomplished and the effluent discharges to an accelator (sludge-blanket settling tank). The fast settling materials are removed here. For further treatment, the liquid is sent through a trickling filter for several passes.



LIGHTNIN SERIES E MIXERS, turbine and paddle types, are supplied for open or closed tanks, in sizes from 1 to 500 HP.



LIGHTNIN SERIES SE MIXERS, for tanks up to 5 million gallons, offer new easy repacking. Modifications for every need. Sizes 1 to 25 HP.



LIGHTNIN PORTABLE MIXERS are used everywhere to do hundreds of mixing jobs. Thirty models to choose from. Sizes ⅛ to 3 HP.

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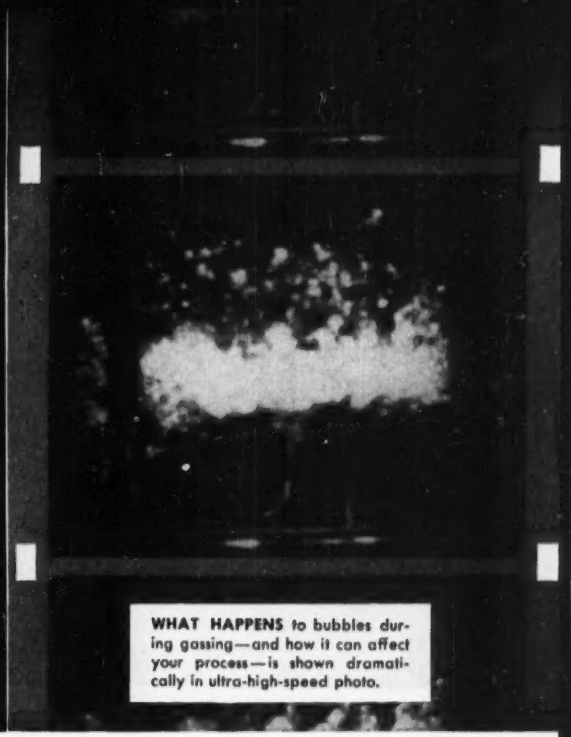
This library of mixing information is yours for the asking. Catalogs contain helpful data on impeller selection; sizing; best type of vessel; valuable installation and operating hints; complete description of LIGHTNIN Mixers.

MIXCO fluid mixing specialists



WHAT HAPPENS to bubbles during gassing—and how it can affect your process—is shown dramatically in ultra-high-speed photo.

How to make a gas bubble work *twice* as hard for you

Notice the stream of gas bubbles sweeping off the mixer turbine blade in the picture.

Now see how the gas at the right is breaking into tiny pin-point bubbles, with tremendous contact area.

Notice how the bubbles break up *after* they leave the turbine blade?

The turbine doesn't split up the bubbles, as is commonly supposed. But it *does* cause turbulence. And turbulence goes to work on the bubbles.

The turbine sets up a fluid *flow* in the vessel, too. Flow is what sweeps the gas through and through the mix, keeping gas in contact *longer*.

WHAT FLUID MIXING DOES

The right combination of turbulence and flow can do wonders for your process. It can *double* the efficiency of gas dispersion.

It can help you get uniform suspensions quickly; cut dissolving time in two; give you tight control of a critical thermal reaction.

Many processors are putting these forces to work, scientifically—with outstanding results. You can, too. But you can't do it with just any mixer. Guesswork won't do it. You have to *be sure* about results.

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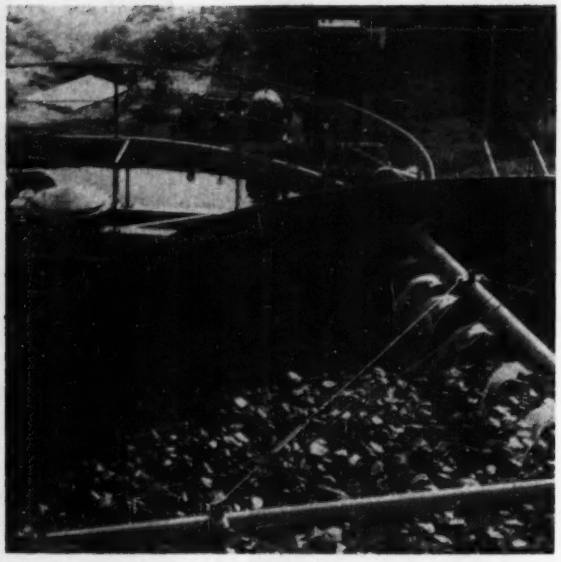
Automatic control of pH is checked by operator.



Trickle filter and settling basin complete the new process.

▶ **Iron and Aluminum Removed**—The bacterial growth on the filter was built up by innoculating with several tank loads of sewage from a nearby municipal treatment plant. The bed, cultivated for a neutral environment, is showing good ability to reduce BOD. It has been found that ferrous iron in the bed will cause development of iron-oxidizing bacteria in the bed. The growth becomes heavy enough to plug the bed mechanically.

To avoid this, the ferrous iron is first oxidized in the degasifier and then removed with the precipitated aluminum floc in the accelator, before the effluent is applied to the bed.

▶ **State Control**—The State of New Jersey has been trying to clean up its Raritan River for a long time. As far back as 1909, the State Board of Health served a cease-pollution order on the largest city in the valley; but it was not until 27 years later that a local treatment plant was built. It proved to be inadequate in only a few years.

Little else was done to treat the wastes of town and factories until the 1930's. Then the state health officials, spurred by public demand, went to the courts for action.

The towns and a few industries built local treatment plants. These soon could not handle the volume of wastes. Continuous growth of population, and industrial expansion in the area, made the treatment plants inadequate by 1940. There were even certain chemical and industrial wastes for which no treatment was known.

The abatement of pollution became sublimated to the war effort during the 1940's. Now the push is on again. By the middle of 1956, the abatement of pollution of the Raritan River is scheduled to be substantially complete.

▶ **Share the Cost**—It would be just too expensive for any of the polluters to go it alone. While some of them have local treatment plants, which may be satisfactory for the present, it won't be long before population growth and industrial expansion will make them obsolete.

With the deadline for pollution abatement set for only a year or two off, several cooperative plans have been proposed. A Middlesex County Sewerage Authority has been active for a few years. Recently, a Somerset-Raritan Sewerage Authority was established.

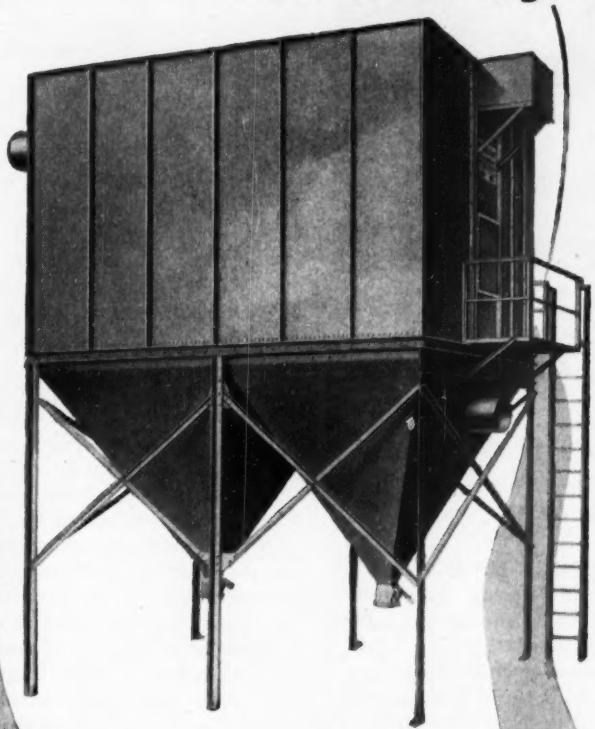
Compounding the pollution problem is consideration of such things as "compensating water" to replace any river water which is diverted for pollution control, the right of the Elizabethtown Water Company to a guaranteed flow of fresh water to supply its customers in Union County, and the large overhead costs of waste treatment plants which make no profitable recoveries.

▶ **Water Is Low**—The main plant of American Cyanamid Co.'s Calco Chemical Division at Bound Brook, N. J., is a major participant in the Somerset-Raritan Sewerage Authority. Calco officials believe that there is not enough water in the Raritan River to allow for diversion of all municipal and industrial effluents along the heavily settled river route. They footed most of the bill for an engineering study by Sheppard T. Powell, and Whitman-Requardt & Associates, sanitary engineers of Baltimore, Md., to provide a practical plan for pollution abatement in Somerset County, considering the water supply and pollution as inseparable problems. According to L. L. Hedgepeth, Calco staff consultant on pollution control and water supply, the drought this past summer proved conclusively that the river flow is insufficient to serve as a water supply for existing municipal and industrial waste treatment plants on the river. Not unless some effluents are returned to the river after adequate treatment and "compensating water" is substituted for those effluents which are diverted into a trunk sewer line.

Other industrial members of the Somerset-Raritan group are Johns-Manville, Research Corp., Sherwin-Williams, and Diehl Mfg. (electric motors). Somerville, Raritan, and Bridgewater Township are the municipal members. They hope to find the best joint solution to their disposal problems. Operating costs of the new plant will be met by service contracts with the users, the original investment to be raised by authority bonds.

GOLIATH LUNGS

...working for industry



The Dracco Multi-Bag Filter — famous peak-performer in industrial dust control and recovery processes.

● Throughout world industry, giant lung-like Dracco Dust Filters inhale billions of cubic feet of costly dust-laden air every minute. By eliminating the expensive consequences and potential damage of uncontrolled dust, these performance-proved Dracco installations answer industry's demand for more efficient dust control.

Dracco Dust Control Systems—controlling hazardous and harmful dusts—have enabled thousands of plants to realize longer plant life, increased safety, improved manpower efficiency and better equipment performance.

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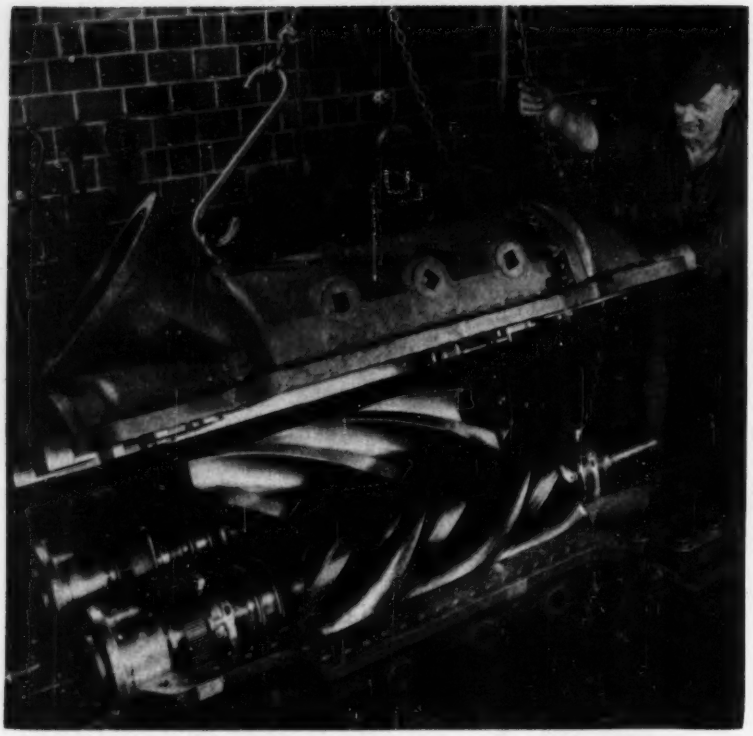


NEW machine must be justified on a sound basis, not just by hunch or guess.

Replace Old Equipment Now?

When to throw out the old, put in the new, is a perennial problem in running a plant. More help to a sound equipment replacement policy is on the way.

The tough but ever-present problem of when and how to replace industrial equipment is beginning to get some of the attention it deserves. A national center to study methods of equipment acquisition and replacement has recently been established in the department of business and economics at Illinois Institute of Technology, Chicago.

The new center is being financed initially by the Machinery and Allied Products Institute, a federation of trade associations and member companies engaged in economic research applying to capital goods industries. MAPI has pioneered in the study of equipment analysis policies; its publications on the subject are widely circulated throughout industry.

In spite of MAPI's efforts, however, equipment replacement policy as generally practiced, says MAPI spokesmen, is haphazard at best. Management decisions in this field, they say, are frequently based on hunches, guesses or inadequate analyses leading to incorrect conclusions.

▶ **To Replace or Not?**—When a machine breaks down or becomes inadequate for the job for which it was designed, clearly it must be either rebuilt or replaced. Which of these alternatives should you choose? If the equipment is to be replaced, should you replace it in kind or should you buy an improved or totally different type? These are typical questions with which equipment policy deals.

However, there are more difficult problems. Seldom is a machine satisfactory one day and completely inadequate the next. Rather, as time progresses, maintenance and operating costs go up and down time increases. At what point in the life of a machine does replacement pay?

Of even greater significance, says MAPI, is the fact that physical deterioration is not the only cause of old age in the case of a machine. A machine may become obsolete when it is still relatively young in years and in physical performance. Management may not be aware of this condition until the company finds itself losing out to competition.

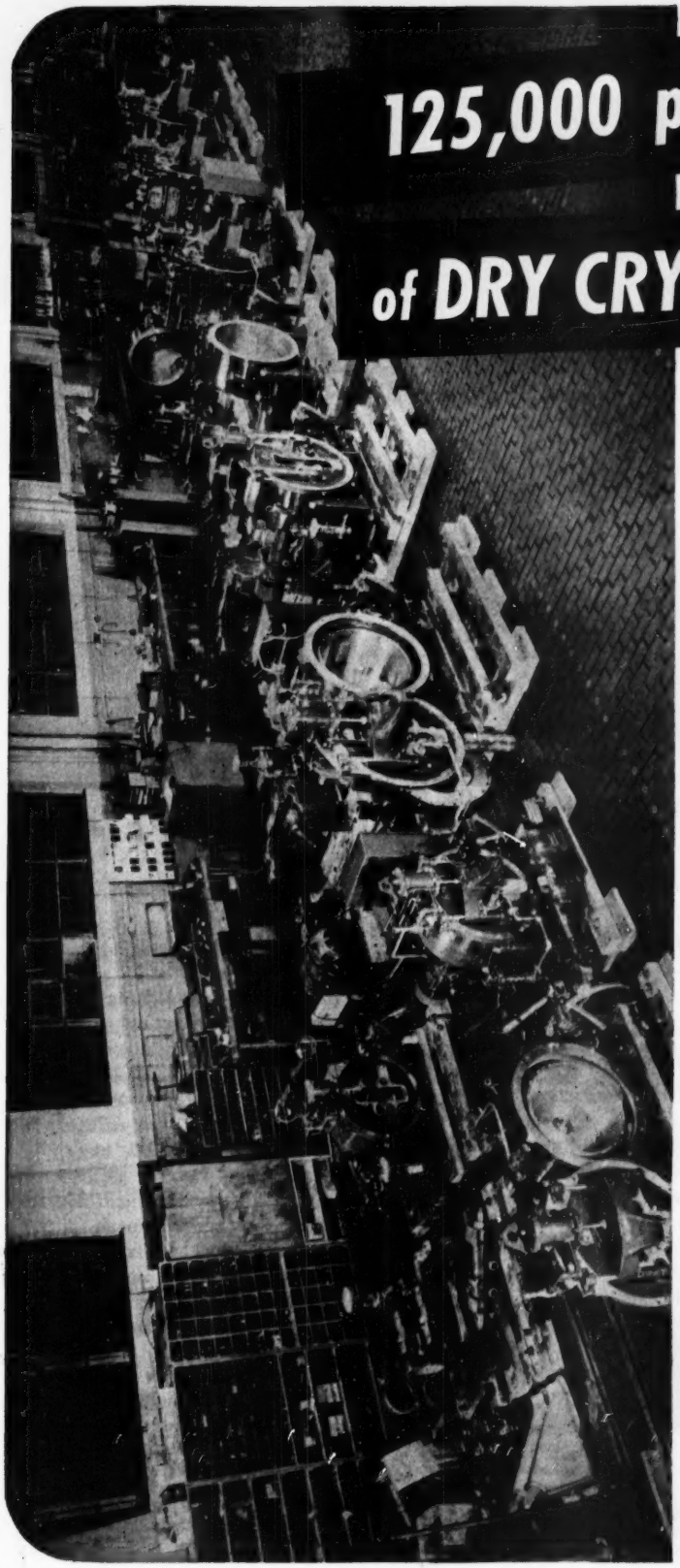
In such cases, how superior should the improved equipment, or challenger, be in order to make its purchase economical? How often should the existing equipment, or defender, be subjected to analysis to see if it should be replaced? In this connection, MAPI suggests, failure to make a study results in a tacit decision—a decision to keep the old equipment. There is no assurance that such a decision is the correct one.

▶ **Education and Research**—Scientific approach to equipment policy affects not only the success of individual businesses but is basic also to the continued industrial leadership of the United States. In order to further the scientific approach, the new center will operate through two basic avenues:

- The wide dissemination of information as to enlightened equipment policy.
- Sustained study of improved techniques and continued analysis of the problems and practices of business and industry in this field.

To implement these objectives, Dr. Pearce Davis, chairman of the Illinois Tech department of business and economics, plans a program involving new undergraduate and graduate courses, summer seminars and conferences for industrial executives, establishment of lectures, fellowships and a library, and research by students and members of the faculty. It is anticipated that some of the more important results of such research will appear in published form.

▶ **Noble Experiment**—Launching of a program of this magnitude and nature is admittedly an experiment. The two sponsoring organizations feel, however, that appointment of Gerald J. Matchett as director of the national center insures the best possible chance of success. Prof. Matchett has been in charge of the campus courses devoted to equipment policy as well as the courses in this field made available to Allis-Chalmers Mfg. Co. in Milwaukee. He is a member of the committee on engineering economics of the ASEE.



125,000 pounds of DRY CRYSTALS per hour!

These 14 Super-D-Hydrators will produce approx. 900,000,000 lbs. of crystals in the next 12 months.

. . . ammonium sulphate, adipic acid, sodium bicarbonate, naphthalene, acetylsalicylic acid, sodium sulphate, sodium chloride, polystyrene, para xylene . . . to mention but a few of the crystals being dehydrated in Sharples Super-D-Hydrators.

The 14 machines recently photographed on the assembly floor of the Sharples plant are mute evidence of industry's increasing recognition of the extreme flexibility and economy that the Super-D-Hydrator offers. Eleven of those shown are the C-27, with capacity ranging up to 8 tons of dry crystals per hour, three are the C-20, with capacities up to 4 tons per hour.

The Super-D-Hydrator is what its name implies — industry looks to Sharples for extra profits in crystal dehydration.

Bulletin 1257 will be sent upon request.

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1 Lift truck carries empty carboys from storage area to process line.

2 After inspection, washed and painted carboys are sent to filler.

3 At filling station, they are filled, weighed, stoppered and sealed.

4 Truck removes carboys from exit conveyor; takes them to storage.

5 Special collars, placed on carboys, permit stacking three high.

6 When ready to ship, truck places palletized carboys on platform.

CIL Slices Carboy Handling Costs

Palletized and mechanized—that's CIL's new carboy handling operation. Pallets, conveyors and a lift truck have teamed to cut labor cost a whopping 60 percent.

Only two years in operation and already more than paid for in lowered labor costs! That's the enviable record of the new carboy handling system at the Hamilton, Ont., plant of Canadian Industries Limited. Monetary gain is only part of the story, however, as there are many byproducts of the new system:

- Skilled craftsmen are released for other work.
- Storage requirements are drastically reduced.
- Labor supervision is greatly simplified.
- Workloads are more evenly distributed.
- Jobs are now standardized.

▶ **Former Method**—Previously, carboys were handled manually in small groups. Facilities included only the bare essentials. Empty and full carboys were transported from one operation to another singly on hand trucks.

Existing facilities did not permit systematic organization of operations nor the application of assembly-line techniques. To perform the six operations required, each carboy was transported nine times, a total distance of about 375 ft. During this period the carboy was sidelined in storage six times.

▶ **Improved Method**—Installation of several sections of gravity roller conveyor, a chain conveyor and a hot-air dryer, plus the use of a gasoline-driven lift truck, have cut the total distance carried to 175 ft. and reduced the number of storage periods to two.

Now, when carboys are received they are palletized on their side and stacked, three high, in an outside storage area. When needed, a fork truck reclaims them from storage and places them on an outside platform. Manually removed from the pallets, they are placed upright on a gravity roller conveyor.

As the carboys pass along the con-

Check These Annual Savings

Former Method		Improved Method	
7 operators	$21,800	4 operators	$12,480
7 helpers	20,400	1 truck man	3,020
1 shipper	3,330	1 shipper	3,330
Total cost	$45,530	Total cost	$18,830

Annual direct savings	$26,700
Plus 15 percent on welfare plans	4,000
Total annual savings	$30,700

ILLCO-WAY ionXchange

daily serving the outstanding plants of American industry

Amine-free Methanol by ionXchange

Process resulting from Illco-Way pilot-plant studies eliminates need for redistribution of contaminated methanol, produces purer alcohol at lower cost.

A problem involved in the synthesis of methanol from carbon dioxide and hydrogen recently came to the laboratory of the Illinois Water Treatment Co. It was explained that excessive amounts of ammonia and organic amines were produced when high-pressure converting systems were first started up or during the period of shut-down. If these materials could be removed by means of ionXchange, a long series of chemical treatments combined with redistillation steps could be eliminated.

In the laboratory, crude methanol was passed through a special Illco-Way exchange material used for organic solution purification. It was observed that the amines and ammonia could be removed by this step. Further laboratory work determined that concentrations of amine and ammonia up to 400 ppm might be present at the start of operations, but that during the average run 8 to 10 ppm was the concentration through the remainder of the cycle. The 8 to 10 ppm is sufficiently low so that subsequent normal treatment given the product produces satisfactory methanol.

In plant operation it is difficult to predict when it will be necessary to shut down a converter; and, as indicated, it is during the shut-down period and consequent starting periods that a highly contaminated product is obtained. Since the cation exchange resin adds no contaminants and does remove amines and ammonia in the hydrogen cycle (even when present in solution in low quantities), it was apparent that the ionXchange process would be advantageous for the production of methanol.

In the laboratory it was assumed that if contaminated methanol were treated by ionXchange no further complicated purification steps would be required in the over-all process. When a full-scale plant for the treatment of methanol was built it was found that not only were ammonia and amines removed but that heavy metals such as iron and copper were retained by the exchange resins. The chief advantage of the ionXchange process lies in the fact that a high-quality end product can be obtained with considerably less intermediate treatment than is required when crude methanol is not treated by ionXchange. This decrease in the intermediate work results in appreciable savings in the cost of the pure end product.

ILLCO-WAY ionXchange

Illinois Water Treatment Co., 844-1 Cedar Street, Rockford, Illinois. New York office: 141 East 44th Street, New York 17. Canadian Distributor: Pumps & Softeners Limited, London, Canada.

METHANOL STUDIED IN ILLCO-WAY LABORATORY

As in the case of methanol, described in the accompanying article, investigation of chemical solutions requiring purification is carried on in this completely equipped ionXchange laboratory. It is maintained by the Illinois Water Treatment Company for the study of process problems on a laboratory-to-pilot-plant-to-process basis. Investigation of process solutions leads to development and manufacture of commercial process equipment. Illco-Way technicians work with individuals who are interested in exploring the possibilities of ionXchange. Research co-operation and facilities are available to industry.

veyor, tops are scrutinized for broken boards and other defects. A short section of the conveyor is mounted on a turntable. Here each side is inspected and repaired.

Each carboy is then inverted over a drain trough and carried on two narrow sections of conveyor—one on each side of the neck. The bottom of the carboy is inspected and repaired while in this position. Also while in this inverted position, spray nozzles are inserted and the carboy is washed and allowed to drain.

The carboy is then tipped onto its side and painted with a fast-drying paint. A chain conveyor moves the freshly painted carboy through a hot-air dryer. After drying, each is stenciled.

Carboys are palletized again and moved on to the filling station. Here again, the conveyor is mounted on a turntable. Carboys and pallet are tared by adjusting the scale to zero, and each carboy is filled in turn with a predetermined weight of acid. After sealing, carboys pass by gravity conveyor out of the building. The lift truck transfers them to storage.

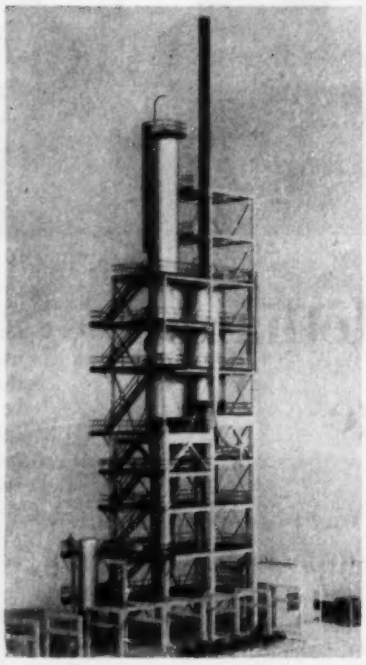
Special hardwood collars enable them to be stacked three high and stored until ready to be shipped.

Total installed cost of the improved system was $52,000. Annual savings on labor alone amount to over $30,000. Thus in less than two years the installation has paid for itself.

Dow's Polystyrene Plant On West Coast Now Running

Polystyrene is now being produced in the Torrance, Calif., plant of Dow Chemical Co. The plant is located in the center of the West Coast's plastics molding industry, and can meet the demands of these molders for the foreseeable future.

Equipped with the latest processing equipment, the plant will turn out a variety of polystyrene formulations. Production facilities are of open construction, while the finishing and packaging sections are inclosed in a brick and steel structure. This building also includes a quality control laboratory. A large storage warehouse adjoins the plant. Dr. J. L. McCurdy is plant manager and D. W. Ryan is production superintendent of the new plant.



World's First Fluid Coker

Fluor Corp., Ltd., of Los Angeles, Calif., will engineer and construction this fluid coking unit, first commercial unit of its kind in the world, at the Billings, Mont., refinery of Carter Oil Co. The fluid coking process was developed by Standard Oil Development Co.

A 120-ft. tower with stairways leading to the nine platform-floors will dominate the coking unit. It took four years of research to develop the fluid coking process.

Fluor expects to complete the Carter unit by October 1954. The fluid coker is the first step in the current expansion at the refinery. Addition of this unit to the Carter plant marks the fourth major improvement since the refinery opened in 1949.

Polyester Fiber Plant Being Erected in Canada

Construction has been started by H. K. Ferguson Co., Ltd., of Canada on the $20 million Terylene plant for Imperial Chemical Industries, Ltd., of Canada. Ferguson, a subsidiary of the H. K. Ferguson Co. of Cleveland, Ohio, is designing and building the plant at Millhaven, Ontario, about 13 mi. west of Kingston, Ontario. Completion of the plant, located on the shores of Lake Ontario, is expected early in 1955.

The plant consists of 10 buildings, including one in which Terylene polymer will be made, a five-story building in which the polymer will be spun into fiber and a large single-story building in which the fiber will be further processed.

There will also be semi-technical, technical service and analytical laboratories, workshops and stores, a boiler house, a recoveries building, a cafeteria and an administration block.

All buildings will have structural steel frames, walls of red brick and built-up roofing. Many of the structures will be air-conditioned. To complete the huge project, an estimated 5,000 tons of structural steel and 10,000 cubic yards of concrete will be used. According to ICI, part of the work will be subcontracted to Montreal and Toronto concerns. At the peak of construction next summer, 1,500 to 1,600 men will be on the job.

Terylene, a synthetic polyester fiber, is used in a wide range of fabrics for apparel, furnishing and industrial purposes, as well as for cordage and a variety of other uses. It resists wrinkling and holds pre-set creases.

Thermofor Cat Cracker For Bay Refining in Michigan

Southwestern Engineering Co. of Los Angeles will design and erect a $3 million packaged Thermofor Catalytic Cracking unit for the Bay Refining Corp. of Saginaw, Mich.

The catalytic cracking unit will have a capacity of 6,000 bbl. per day, and a catalytic polymerization unit will have a capacity of 300 bbl. per day. Auxiliary equipment for these two major units are included in the construction. The new facilities will be erected at Bay's refinery at Bay City, Mich., and are expected to be completed in the fall of 1954.

Bay Refining Corp., currently a producer of specialty naphthas, middle distillates and fuel oil, will be able, as a result of its new installation, to produce substantial quantities of high-octane gasoline. The expansion will increase the refinery's crude run to 10,000 bbl. per day.

Production of high-octane gasoline will not interfere with the current level of output of specialty products.

The unit for Bay Refining will be

Dependable Source for Chemical Raw Materials

Clifton B. Smith, Manager of Operations, and some typical packaging designs by Transparent Package Company, Chicago, Ill.

Secret weapon for more sales

Transparent packages, made with quality ingredients including Wyandotte Caustic Soda, are the secret weapon in many of the modern methods used in successful sales programs in the food field. Read what Clifton B. Smith, Manager of Operations, Transparent Package Company, Chicago, Ill., says:

"Our business is mighty competitive. Almost every job is a custom job, starting with the design and ending with the printing right in our own plant. Many of our Tee-Pak processes are exclusive. We cannot divulge them to others. But, we can say that we appreciate the technical service Wyandotte Chemicals furnishes us, and we have always found Wyandotte Caustic uniform and of consistent high purity. This is a must with us in the food industry.

"We, at Tee-Pak, like the way, too, that Wyandotte representatives keep supplying us with new product development data which they think may be of importance to us."

How about *your* business? If you use alkalies, chlorine, calcium chloride, wetting agents, detergents, solvents, fumigants, insecticides, or other organic or inorganic chemicals, contact Wyandotte for either product data or technical service. Tell us your requirements . . . we may have an existing chemical, or work with you in developing a new one, that will satisfy your needs. *Wyandotte Chemicals Corporation, Dept. CE, Wyandotte, Michigan. Offices in principal cities.*

Wyandotte
CHEMICALS
HEADQUARTERS FOR ALKALIES

P.S.: If you have need for pertinent data on Caustic Soda, send for Wyandotte's new Caustic Soda Book . . . you'll find it helpful.

the third packaged TCC unit developed by Southwestern Engineering. The first was installed at the Artesia, N. M., plant of New Mexico Asphalt & Refining Co., and the second was built for Vicker's Petroleum Co. of Wichita, Kan., at its Potwin plant. Socony-Vacuum Oil Co. originally developed the process and licenses Southwestern Engineering.

The streamlined SWECO cat cracking unit was developed specifically for independent refiners who seek to expand their capacity in the high-octane field without a disproportionate capital investment.

The SWECO package includes feed preparation, catalytic cracking section, fractionation, gas plant and catalytic polymerization. Maximum flexibility and economy of operation are the dual objectives of the design.

Costs are minimized by shop fabrication of all component parts for rapid low-cost field assembly, by standardized and simplified design and by preengineering of a large percentage of the plant.

A major cost-cutting step in the Bay Refining installation will be a derrick structure that will serve both as erection rigging and final support for equipment in the catalyst circulating system.

New Reforming Process Uses Platinum Catalyst

Greater yields of high-octane gasoline stocks are promised the petroleum industry by a new refining process of Standard Oil Co. of Indiana. The process is an improved way of reforming the straight-run naphtha in crude oil.

Joseph K. Roberts, general manager of research and development, says it took years for Indiana Standard researchers, working principally in the Whiting, Ind., laboratories, to develop the process.

Straight-run naphtha in crude oil is low in octane number. For use in gasoline, refiners must improve its anti-knock performance by reforming it.

In Standard's new reforming process, called Ultraforming, the change is brought about by a catalyst that contains platinum. A number of reactors are used, each holding a bed of catalyst pellets.

"Ultraforming has so many advantages that Standard and its subsidiaries are now building units at three refineries. They will start operating next year," says Roberts.

"The main superiority of Ultraforming lies in the fact that the unit does not have to be shut down when the catalyst begins to lose activity through use," Roberts explains. "Catalyst activity can be restored while the unit is still operating.

"This regeneration feature has a number of advantages. It permits operation at low pressures, where gasoline yields are higher. It makes possible a higher octane number. And it increases the variety of feedstocks the refiner can use; it lets him process stocks that would wear out other catalysts."

Ultraforming also increases yields of hydrogen, a valuable byproduct of catalytic reforming.

Standard's researchers ran extensive studies on 17 research and pilot units. Operating at 200 psi., they produced a 5 percent greater yield of 95 octane fuel than with conventional processes, which use 500 psi. and higher.

Ultraforming units now being built, and their daily capacities, are: Pan-Am Southern Corp.'s El Dorado, Ark., refinery, 6,800 bbl.; at Pan American Refining Corp.'s Texas City, Tex., refinery, 21,200 bbl.; and at Standard's Wood River, Ill., refinery, 9,000 bbl.

Catalyst for the Ultraforming process will be supplied by American Cyanamid Co.

Standard will license other refiners to use its Ultraforming process on a royalty basis. The licenses give operating rights under Standard's patents, including future improvements. (*What's Happening cont. on p. 414*)

CONVENTION CALENDAR

Commercial Chemical Development Association, winter meeting, Statler Hotel, St. Louis, January 19.

Association of American Soap & Glycerine Producers, annual meeting, Waldorf-Astoria Hotel, New York, January 26-28.

Chlorine Institute, Inc., annual meeting, Biltmore Hotel, New York, January 27.

Chemical Institute of Canada, protective coatings conference, Toronto and Montreal, February 25-26.

Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, William Penn Hotel, Pittsburgh, March 1-5.

Drug, Chemical & Allied Trades Section, New York Board of Trade, annual dinner, Waldorf-Astoria Hotel, New York, March 4.

American Institute of Chemical Engineers, national meeting, Statler Hotel, Washington, D. C., March 8-10.

Commercial Chemical Development Association, annual open meeting, Statler Hotel, New York, March 17-18.

Industrial Research Institute, award dinner, San Francisco, April 22.

Association of Consulting Chemists & Chemical Engineers, symposium and banquet, Belmont Plaza Hotel, New York, April 27.

Volume 61—Chemical Engineering—Number 1

Chemical Engineering, with which is incorporated *Chemical & Metallurgical Engineering*, is the successor to *Metallurgical & Chemical Engineering*, which in turn was a consolidation of *Electrochemical & Metallurgical Industry* and *Iron & Steel Magazine*, effected in July 1906.

The magazine was originally founded as *Electrochemical Industry*, in September 1902, and was published monthly under the editorial direction of Dr. E. F. Roeber. It continued under that title until January 1905 when it was changed to *Electrochemical & Metallurgical Industry*. In July 1906 the consolidation was made with *Iron & Steel Magazine* which had been founded eight years previously by Dr. Albert Sauveur. In January 1910 the title was changed to *Metallurgical & Chemical Engineering*, and semi-monthly publication was begun Sept. 1, 1915. On July 1, 1918, the title was changed to *Chemical & Metallurgical Engineering* and weekly publication was begun Oct. 1, 1919. Monthly publication was resumed in March 1925.

In August 1946 the words "*& Metallurgical*" were dropped from the main title to bring its name more in keeping with the editorial content.

Dr. E. F. Roeber was editor of the paper from the time it was founded until his death Oct. 17, 1917. After a brief interim he was succeeded by H. C. Parmelee. Ten years later, Nov. 1, 1928, Dr. Parmelee assumed other responsibilities in the McGraw-Hill Publishing Company and Sidney D. Kirkpatrick was appointed editor.

Dr. Kirkpatrick was named editorial director July 1, 1949, and at that time he was succeeded as editor by John R. Callaham.

The present editorial staff is, in addition to Dr. Kirkpatrick and Mr. Callaham: L. B. Pope, managing editor; T. R. Olive, senior associate editor; C. H. Chilton and M. M. Hoover, associate editors; C. S. Cronan, R. F. Fremed, R. B. Norden, E. T. Thompson and Margaret Redfield, assistant editors; J. A. O'Connor, news editor; H. T. Sharp, editorial assistant.

Editorial regional representatives are: James A. Lee, Houston; Elliot Schrier, San Francisco; F. C. Byrnes, Chicago.

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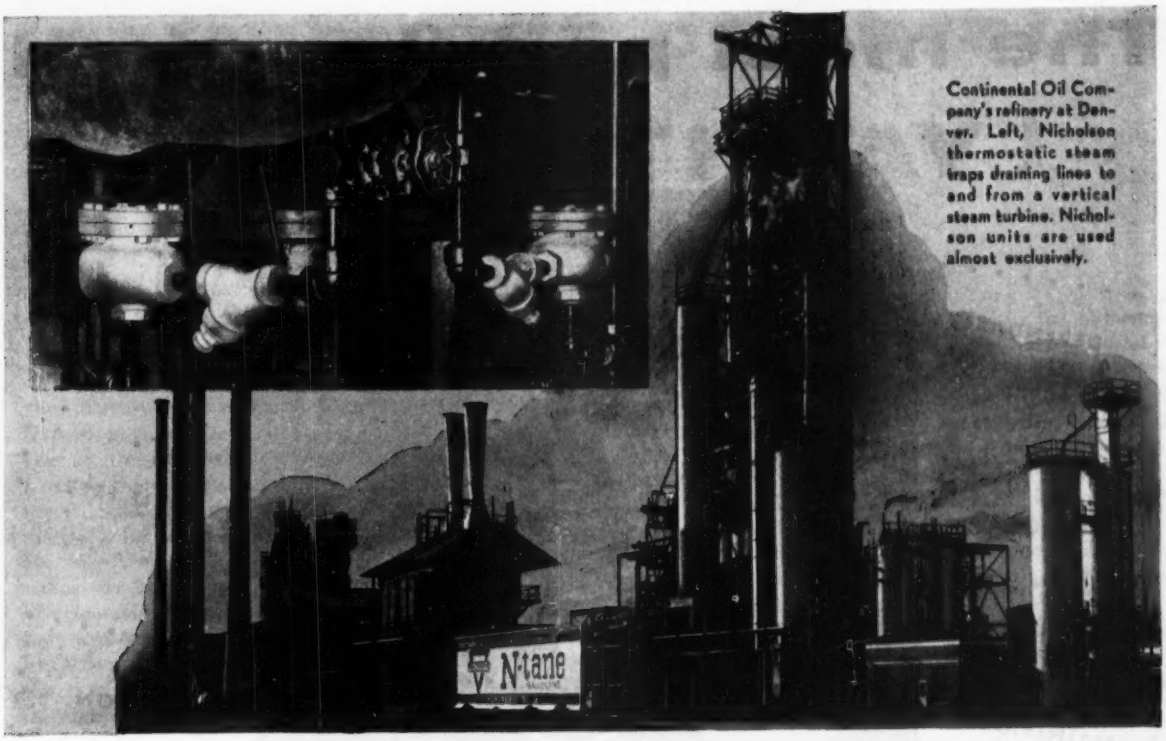

Continental Oil Company's refinery at Denver. Left, Nicholson thermostatic steam traps draining lines to and from a vertical steam turbine. Nicholson units are used almost exclusively.

NICHOLSON TRAPS SELECTED for CONOCO Refinery

This Continental Oil Company refinery has adopted Nicholson steam traps because they proved most effective generally in improving heat transfer. This is an advantage which, we believe, is important to plant men in every industry. A recent survey showed these Nicholson features to be the reasons why plants with standardization-for-economy programs are increasingly adopting Nicholson traps: (1) Two to six times average drainage capacity. (2) Operate at lower temperature differential. (3) No air binding. (4) Freeze-proof. (5) Only one moving part. (6) No change of valves for varying pressures. (7) Record low for steam waste. For process, power, heat.

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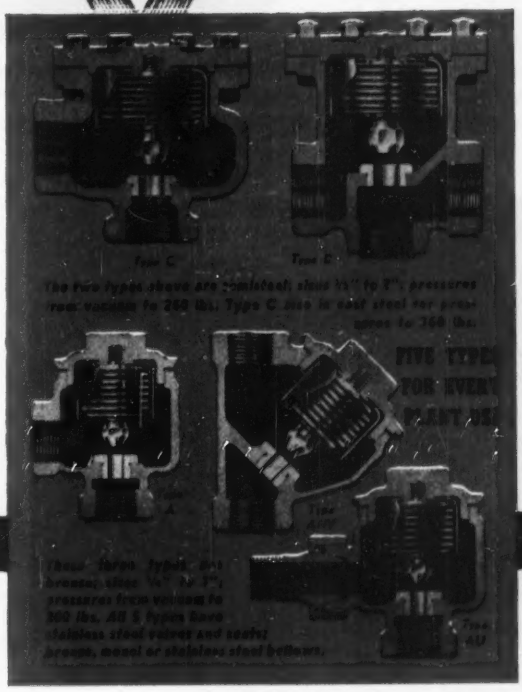

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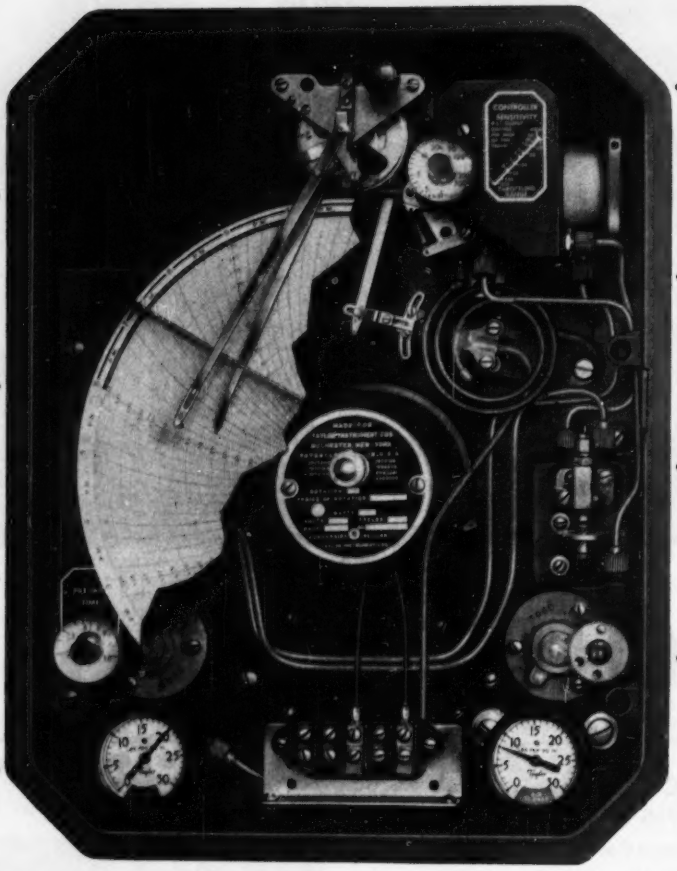


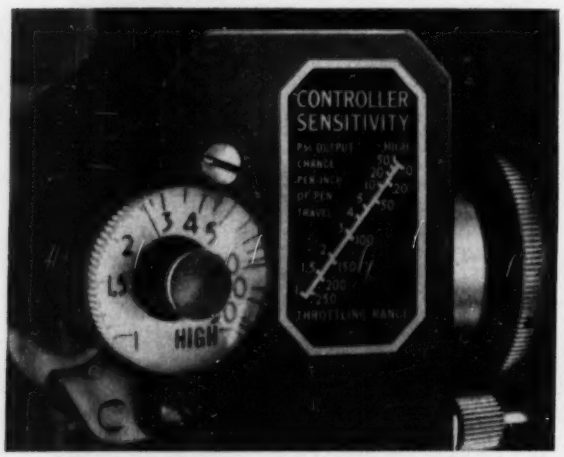
VERSATILE

TROUBLE-FREE

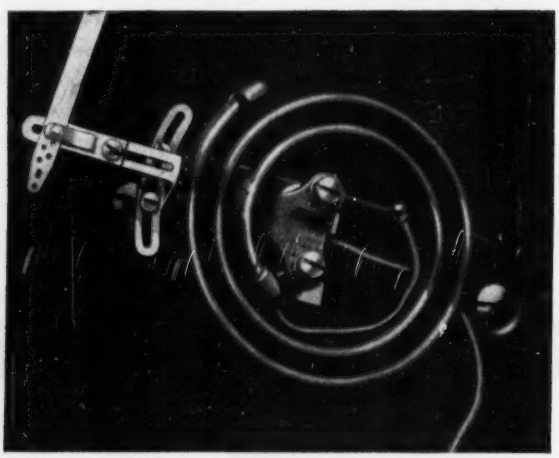
SIMPLE OPERATION

LONG LIFE

Single Duty FULSCOPE Recording Controller with Adjustable Sensitivity, Automatic Reset and PRE-ACT responses. Double Duty control mechanisms, with *any* combination of control responses, afford a great advantage on many applications.



Sensitivity adjustment unit; single, continuous adjustment calibrated in specific units.



Improved sub-base permits easy, precise replacement of pre-calibrated actuating systems in field.

instruments celebrates its 15th BIRTHDAY !

THANKS to you, the Taylor FULSCOPE* Controller today enjoys unrivaled popularity. We say thanks to you because this instrument was designed to meet your exacting requirements as determined by an industry-wide survey. The result is dependable performance year after year, and low maintenance cost. In the petroleum industry, natural gasoline plants particularly, these instruments are relied upon to operate automatically for hours on end unattended. Thus the operators are freed to take care of other maintenance duties.

For the benefit of those who are new in positions of responsibility in the selection of instrumentation, here are some of the reasons why Taylor Series 100 FULSCOPE Controllers have been able to meet these exacting requirements and consequently reign supreme th oughout industry.

ADAPTABILITY

1. Extremely versatile. The same control mechanisms are available for Temperature, Pressure, Flow and Liquid Level—in either recording or indicating models, as locally mounted controllers, transmitters or controlling receivers. Interchangeable unit construction permits a small inventory of parts. Pre-calibrated units eliminate expensive checking. Easy visibility and accessibility of components means an instrument man can have a unit back on the job with minimum down time.

2. Adaptable to any control problem because the FULSCOPE Controller has three control effects:

(a) Proportional Response—available in three forms: Fixed High Sensitivity (1000 psi per inch pen movement): Adjustable Sensitivity (1000 to 1 psi); and Limited Range Sensitivity (400 to 30 psi). **(b) Automatic Reset Response,** completely and continuously adjustable (.05 to 5 repeats per minute). **(c) PRE-ACT* Response** (rate action) continuously adjustable within the range of 0.2 to 10 mins. All the adjustments are wide range and continuous. Any combination of these control responses may be used to provide any required quality of control. PRE-ACT and reset units are interchangeable.

3. Proper Adjustment Easily Obtained. Control Response Adjustment Dials are calibrated in specific units, repeatable in all instruments. Optimum settings are quickly determined.

4. Controller action simply changed by lifting a spring clip and rotating set-point knob.

DEPENDABLE OPERATION

5. Control point always matches set point when automatic reset is used, thanks to fully pneumatic sensitivity reduction. Lowering sensitivity for stability does not reduce the effectiveness of the reset response. Result—control point always returns to set point, regardless of load changes.

6. Trouble-free air system. Metal disc type filters are built-in features, easily removed for cleaning. Both relay air valve and nozzle are made of 18-8 stainless steel. A simple system, made of corrosion resistant parts, easily accessable for cleaning.

7. Lifelong Accuracy. Fewer links and pivots. Dead spot and hysteresis practically non-existent due to lightweight stainless steel link and small diameter burnished pivots. This lightweight construction nullifies vibration effects. Spring pivot clips, which do not gum up or corrode, replace screws. Over and under-range linkage protection provided when required.

Whether your processing problems are simple or complex, there's a Taylor instrument or control system and a competent Taylor Field Engineer ready to help you solve them.

Write for Bulletin 98151. Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

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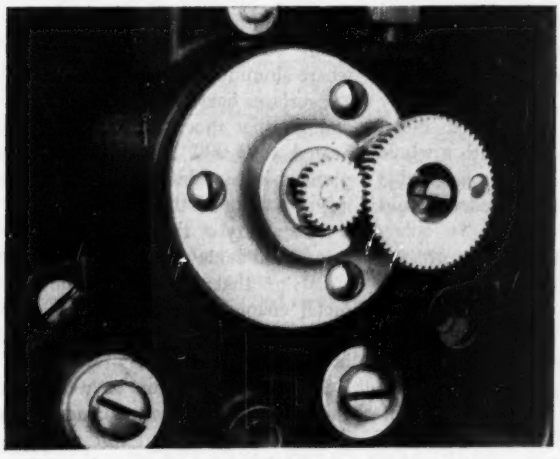


Interchangeable needle valves in Automatic Reset and PRE-ACT units.

Taylor Instruments
MEAN ACCURACY FIRST

Old Building gets . . .

New Face because . . .

Glass + Aluminum = Durability + Low Weight

Porcelain enameling, using Du Pont developed vitreous fruits, is opening up big new markets for aluminum. After 10 years of field testing, potential looks excellent.

Marriage of youth to age, while usually frowned upon for human beings, more often than not is a real engineering achievement when chemical products are the participants.

Dramatically pointing this up is the recent wedding of age-old glass to aluminum, a relative upstart among building materials. The resulting product, porcelain enameled aluminum, is impervious to almost all corrosion, can be sawed, drilled or punched with no danger of progressive spalling at the exposed edges and is decorative to boot.

Uses for the new material are legion. It's been predicted that as much aluminum (sq ft.) will be porcelain enameled annually by 1970 as there is steel enameled today.

▶**Buildings to Bathtubs**—Most important now are structural applications, both siding and roofing. The growing trend toward metal-sided office buildings will undoubtedly be accelerated by the availability of tough, colorful aluminum.

Small structures, too, are an important outlet. One service station that used paper honeycomb sandwiched between two sheets of porcelain enameled aluminum instead of conventional cinder blocks reports a saving of over $500 in construction costs. And since the material doesn't corrode under salt water attack, many coastal areas will, for the first time, be able to erect aluminum buildings resistant to pitting or scaling.

Ultimately, though, home appliances are likely to be the biggest market. While aluminum stoves, refrigerators and washers are desirable because of their light weight and ease of fabrication, sales have been restricted by buyer resistance to uncoated metal finishes. Now, however, with a whole raft of colors available in a durable porcelain finish, this resistance should disappear.

In the chemical field, pipes, fittings, small tanks and heat exchanger shells look like the best bets (plus, of course, structural uses). Here again, low weight, high strength and chemical resistance are the major advantages.

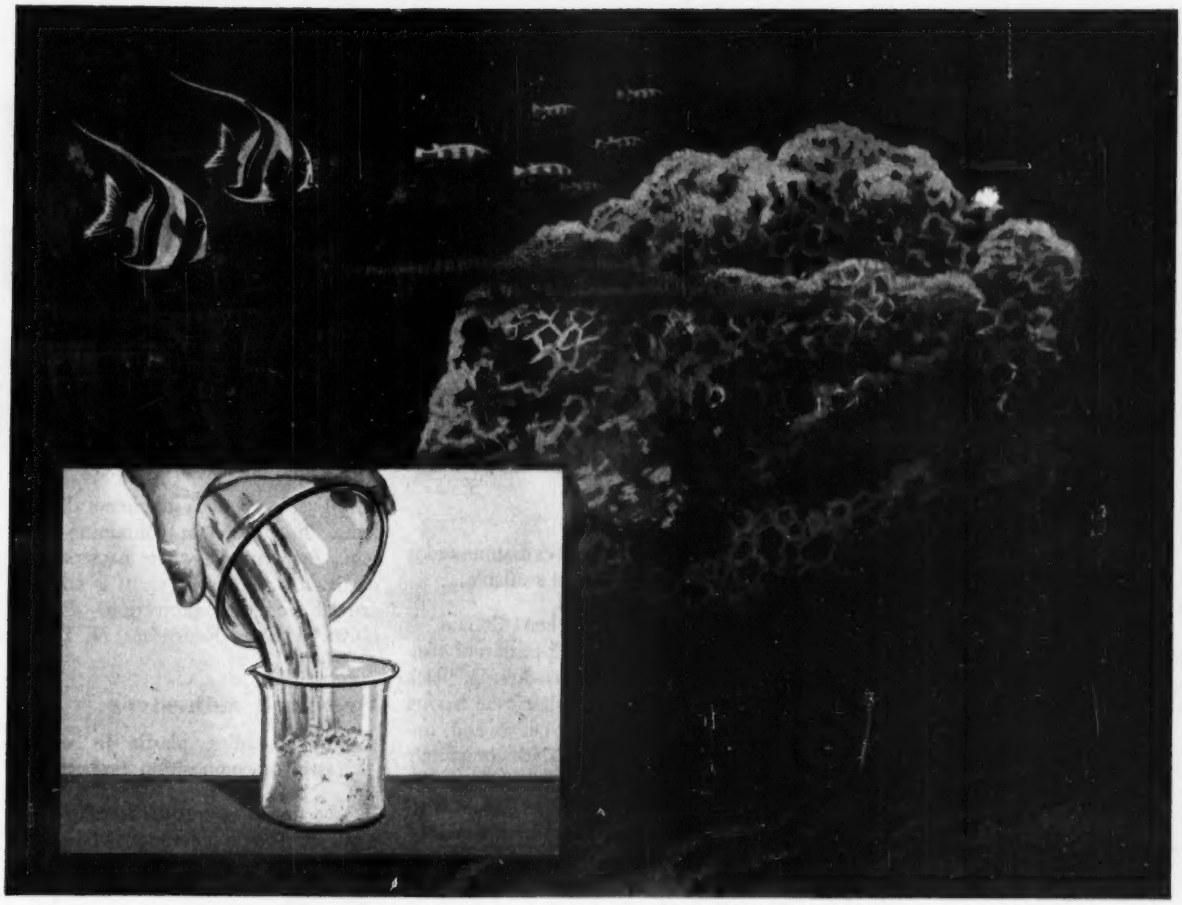
Other potential uses include architectural tile, marine applications, furniture and lightweight sanitary ware such as sinks and bathtubs. Because of their lead content, enamels are not recommended for aluminum surfaces which may come in contact with food.

▶**New Frits Hold Key**—Lion's share of the credit for this development goes to Du Pont's Electrochemical Dept. which developed low-fusion-temperature vitreous enamel frits to do the job. Sharing in the development are Ferro Corp., Cleveland, and Pemco Corp., Baltimore, who are making frit under license from Du Pont. Among the pioneer users was Kawneer Co., Niles, Mich., which sells facing materials under the name Zourite (see cuts).

These complex glass compounds fuse to aluminum at 970-1,000 deg. F., about 100 degrees below the point where aluminum distorts. Once fused, the surfaces have excellent impact, flex and thermal shock resistance. Panels heated to 1,000 deg. F. have been plunged into cold water with no cracking or flaking of the finish.

The ability of the enamels to withstand mild acids, alkalis and sulfides is equal to that of other commercial metal enamels and the surfaces have shown no deterioration after 480 hours in a 20 percent salt spray test.

Enameled stock can be welded on the reverse side without damage to the surface and enamels are readily applied over welds. In addition, its voltage breakdown rating is 500 v./mil thick-



Like nature's porous sponge, Celite has extremely high absorptive capacity. It absorbs 220% of its own weight of water (Gardner-Coleman method)

High absorption

Celite diatomite powders absorb twice their own weight of liquid

Here is a material in powder form, so porous that 93% of its volume consists of tiny interconnected pores. This unique structure gives Celite* an exceptionally high absorptive capacity which is now being put to profitable use in a wide variety of industries. For example, Celite serves as a dry carrier for insecticide poisons . . . helps control viscosity in adhesives . . . and makes a highly effective anti-caking agent in fertilizers.

The unique structure of the microscopic Celite particles offers many other advantages. These particles are spiny and irregularly shaped, strong and rigid . . . as a result they do not pack together. Thus Celite powders have great bulk per unit weight . . . making them valuable for fluffing up dry powders such as household cleansers . . . and extending pigments in paint and paper.

Celite's physical structure itself is also utilized in many different ways . . . as the outstanding flatting agent for paints . . . as a mild non-scratching abrasive for fine polishes . . . and to improve surface appearance in plastics. And it is also the reason why Celite can add strength, toughness, stiffness, durability and many other desirable characteristics to your product.

If you want improved product performance or lower production costs, investigate industry's most versatile mineral filler. One of the J-M Celite Engineers will gladly discuss your problem. These men are backed by complete technical services and the Johns-Manville Research Center, largest laboratory of its kind in the world. For further information write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ont.

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ness, suitable for shielding and insulating uses.

▶**Clean, Apply, Fire**—Application methods for enameling aluminum are essentially the same as those for applying porcelain to steel except that temperatures are lower, a fact which effects economies in the initial cost and in operation of furnaces.

The first step is a thorough cleaning and pretreating of the stock followed by solvent or vapor degreasing and immersion in a chromate-caustic bath.* Water washing is used to remove excess treating solution and stop chemical action.

A primer coat of frit—supplied in a coarse form to be ground by the enameler—is sprayed on in a thin coat and dried at low temperatures. The articles are then placed on a rack and fired at 970-1,000 deg. F. in a conventional furnace.

Usually one pigmented cover coat is enough, applied in the same manner as the primer. Total recommended enamel thickness is 1-6 mils, heavy coats having higher resistance to scratching and abrasion, light applications, better thermal and mechanical shock resistance.

An accelerated spalling test, consisting of immersion of the finished piece in a 5 percent ammonium chloride solution at room temperature, must be used. Field samples that have passed this test have been in service for six years without failure and are still going strong.

▶**Priced Competitively**—An average thickness of enamel on aluminum—4 mils—costs about 8c./sq. ft., slightly higher than for steel. But because it's necessary to use a premium steel, some of which is processed up to 4-5 times, makers of porcelain enameled aluminum have actually been underbidding producers of enameled steel recently. And even at a higher price, the weight savings afforded by aluminum—up to 50 percent for a comparable flexural strength—make potential users sit up and take notice.

The producers are quick to point out, however, that competition for markets now held by steel is not their primary object. Instead, they plan to exploit new markets for aluminum by providing a product that's superior to uncoated aluminum in many ways.

* Six aluminum alloys are recommended for enameling: wrought 61S, 2S and 3S, nonporous castings of 43 alloy, extrusions of 53S, 62S and 63S.

IN BRIEF—A capsulated listing of this month's newsworthy products.

It's New . . .	It's Good for . . .	See Page . . .
Porcelainized Aluminum	Providing durability and color	136
Filteraid	Filtration of alkaline solutions	138
Mildew Preventive	Protecting paper mills against bacterial action	138
Pressure Adhesives	Cheaper bonding of plastics to metals and wood	138
Emulsifiers	Formulations of liquid insecticides and herbicides	138
Refined Guar Gum	Stabilizing and bulk forming agents	140
Silicone Rubber	Uses requiring low long term shrinkage	140
Carbon Black	Giving up to 25 percent more milage to tires	140
Low-Suds Detergent	Both industrial and home cleaning applications	140
Hot-Cold Lubricants	Use over a wide range of ambient temperatures	142
Nonskid Floor Paint	Preventing accidents resulting from slippery floors	142
Release Agent	Removing epoxy resin products from molds	142
Aluminum Pastes	Paints; will not leaf or flow in formulations	142
Zinc Stearate	Anti-tack agents in rubber milling and compounding	142
Lauryl Sulfates	High quality uses that require low price	142
Vegetable Wax	Manufacture of carbon paper and polishes	142
Packing Compound	Valves and pumps operating at negative pressures	142

Filteraid

Has advantages over diatomaceous silica; carload lots available.

Nerofil, a new carbon filteraid, is particularly suited for filtration of alkaline solutions. The free-flowing, black powder yields a wet filter cake having a density of 18-21 lb./cu. ft. and, unlike diatomaceous silica, it's completely resistant to alkaline solutions. At the same time, it provides the same high porosity and permeability offered by the silica. The filter coke is also combustible, thus simplifying waste disposal problems.

Initial production is in a 6-ton/day pilot plant, with shipments in carload lots. Expanded production will be undertaken as demand develops.—*Great Lakes Carbon Corp., Morton Groves, Ill.*

Mildew Preventive

For paper mill felts; eliminates need for bactericides.

Dewpruf, a new, effective treatment for the prevention of bacterial damage, is now available to the paper industry. It can be used to improve felt operations because it is a permanent treatment that resists leaching, does not reduce the wet tensile strength of woolen felt and can be used throughout the pH range in which bacteria are active.

Best results are obtained in a temperature range of 80-140 deg. F. and in a pH range of 3.0-6.5. And it will last the lifetime of the felt.

Other uses include protection during shutdown periods when the wool is damp and readily accessible to air, during storage and in chemical systems. In phosphate containing systems, for example, where bacteria are particularly active, Dewpruf is said to provide complete protection.—*F. C. Huyck & Sons, Rensselaer, N. Y.*

Pressure Adhesives

For bonding plastic to wood, steel or composition surfaces.

Two new pressure-contact adhesives that permit easier, cheaper bonding of plastics to surfaces in the home have been announced by G-E. Unlike conventional bonding methods that require presses or clamps, the new adhesives permit easy rolling with a linoleum roller or its equivalent.

Samples of G-E Textolite plastics were bonded to wood and steel and left to hang for two years with 50 pounds of dead lead per sq. in. on them. No noticeable failure or heat fatigue appeared.

Of the two adhesives, Type A is made for professional bonding, Type B for do-it-yourself use on wood surfaces by home craftsmen. The latter is considered easier for an inexperienced person to handle.—*General Electric Co., Coshocton, Ohio.*

Emulsifiers

For insecticides; Methoxychlor, DDT and lindane are among toxicants that can be emulsified.

Four new emulsifiers for the formulation of liquid insecticidal and herbicidal concentrates are now being made by Thompson-Hayward Chemical Co., a newcomer to the emulsifier field. These products are said to satisfy most

HEYDEN FOR HEXAMINE

To the resin chemist, it's

HEXAMETHYLENE TETRAMINE

To the pharmaceutical chemist, it's

METHENAMINE

Other users prefer the shorter name Hexamine. Whatever your favorite name may be--and there are many others--you can depend on Heyden "Hexa" for top quality and uniformity. As a prime producer of both the pharmaceutical and industrial grades in large volume, Heyden has the "know-how" to meet your most exacting requirements.

U.S.P. Powder and Granular:
100, 50, 25 lb. fiber drums.

Technical Granular:
75 lb. multiwall bags,
100 lb. fiber drums.

Technical Powder:
50 lb. multiwall bags,
100 lb. fiber drums.

•

FORMALDEHYDE

N.F. Solution - - in tank cars, tank trucks, 475 lb. drums, 100 lb. carboys, and bottles.

37% Formaldehyde, Methanol-Free - - in tank cars and tank trucks.

PARAFORMALDEHYDE

U.S.P. X Powder and Flo Granules. 250, 100, 50 and 25 lb. fiber drums.

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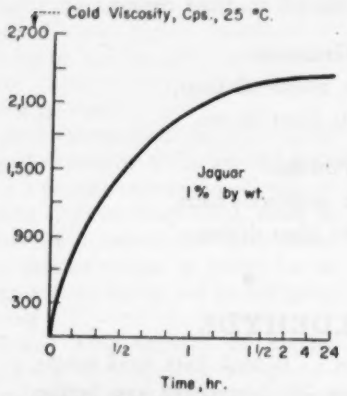
of the emulsifier requirements of the newer pesticides.

• T-H Emulsifier C-I is designed for the emulsification of chloro IPC. It is the most water soluble of the series. Quantity required varies from 5 to 15 percent.

• T-H Emulsifier D-I is suited for preparing DDT and benzene hexachloride emulsions. It has also been used in making Methoxychlor and Rothane concentrates. Used in 3-5 percent concentrations, D-I is the least water soluble and most oil soluble of the series.

• T-H Emulsifier M-I, used at levels ranging from 2½ to 5 percent, will impart good emulsion characteristics to concentrates containing lindane, dieldrin, aldrin and heptachlor.

• T-H Emulsifier W-I is recommended for emulsifying chlordane, toxaphene, parathion and esters of 2,4-D and 2,4,5-T. Amounts vary from 3 to 6 percent.—*Thompson-Hayward Chemical Co., Kansas City 8, Mo.*



Refined Guar Gum

A natural hydrophilic colloid with good cold water swelling properties; valuable to cosmetic, food and drug industries.

For the first time you can get refined guar gum, a natural hydrophilic colloid, in unlimited commercial quantities. While similar products have been on the market in the past, they were in very limited supply.

Excellent cold water swelling (see *cut*) is the distinguishing feature of this gum, tradenamed Jaguar. It also swells in gastric and intestinal fluids and produces high viscosity at low concentrations over a wide pH range. These properties suggest uses as a bulk forming agent in laxatives and as a tablet-disintegrating agent. According to the manufacturer, 1-5 percent Jaguar is added to a tablet granulation or mixed with the active ingredients before granulation. Larger amounts can be used if desired.

For food processors, Jaguar will be of most interest as a stabilizing agent for cheese spreads, salad dressings, frozen foods and prepared meats. Its high water-holding capacity, heat shock resistance and smooth texture mean longer shelf life, not only for these food products, but for a whole range of pastes and jellies.—*Stein, Hall and Co., Inc., New York, N. Y.*

Silicone Rubber

Has lowest long term shrinkage of any silicone rubber stock.

Heralded as the most significant silicone rubber development in four years, Silastic 675 is now available from Dow Corning. It is expected to find its biggest use in stock for gaskets, O-rings, seals and molded industrial goods. And where tolerances aren't too close, it can be molded in dies designed for organic rubber parts.

The new material has a long term shrinkage of 1.8-2.5 percent, lowest of all silicone rubber stocks. It also has the lowest compression set values of any silicone rubber with nontoxic additives.

Physical strength is excellent, too. Its tear resistance of 80-90 compares to 40-50 for ordinary stocks. And it is serviceable at temperatures ranging from −100 to above 500 deg. F.—*Dow Corning Corp., Midland, Mich.*

Carbon Black

Gives as much as 25 percent more mileage to truck and auto tires.

Aromex 125, a new super-abrasion furnace black, is now in commercial production. Characterized by a fine particle size with high structure, the product is said to deliver up to 25 percent more tire mileage. Also, tests show improved resistance to chipping and cracking, very important in the manufacture of heavy duty truck and bus tires.

Initial production is coming from the company's Borger, Tex., plant and additional capacity is planned at its Eldon, Tex., installation.—*J. M. Huber Corp., Borger, Tex.*

Low-Suds Detergent

New alkyl aryl sodium sulfonate makes bid for growing industrial cleaning market.

A new, low-sudsing detergent, Udex, is now in full-scale commercial production, giving added impetus to the growing trend toward sudsless cleaners. And by getting into the market at this time, the new product should get a nearly-free ride from the intensive advertising and educational campaign that's on for Monsanto's All.

Suds, although they're pretty, actually contribute little to thorough cleaning and often raise hob with cleansing equipment. In industrial applications, high foam severely reduces the bath or vessel capacity for other cleaning chemicals or for cleaning loads.

In home and commercial laundries, super-sudsing detergents require more rinses to get clothes suds-free. This means bigger water bills and more wear and tear of the washers.

In addition to its low-sudsing properties, Udex is stable in alkaline solutions to a pH of 11.5, instantly soluble in water and most acids and blends easily with builders. It has one big disadvantage from a marketing standpoint, though: it's tan and household consumers have traditionally demanded white detergents. This means that until the color problem is licked, Udex will probably be limited to industrial markets.

But although not as big or lucrative as the home market, industrial detergents for commercial laundries, metal cleaning, bottle washing and dairy cleaning constitute a big, growing field. If Udex can sell these outlets, it should bring in plenty of business to tide it over until the color problem is solved.

Udex is made from low cost petro-

For Fine Organic Specialties

See B&A First

If You Use high purity process chemicals, you no doubt know "Baker & Adamson" products well, for as America's foremost producer of fine chemicals, B&A has supplied leaders in industry for over 50 years.

While B&A is recognized primarily for its inorganic fine chemicals, it is also a pioneer in the organic field, producing many "specialties" required by industry.

With its versatile and extensive production facilities, B&A is in an excellent position to work *with you* in providing *special organics* not available from regular commercial sources. A number of the B&A organic chemicals listed here were originally developed for customers' research and product development programs.

If You Need *special organics* in commercial or pilot plant quantities, it will pay you to investigate B&A's ability to make them for you. Your call may prove the start of a satisfying, lasting relationship for you as it has for so many other companies.

Typical examples of Baker & Adamson Fine Organic Special Chemicals are:

Acetamide
Anhydrous Oxalic Acid
Cadmium Propionate
Oxamide
Oxanilide
Salicylamide
Sodium Biphthalate
Sodium Salt of Dimethyl Glyoxime

GC Allied Chemical

BAKER & ADAMSON® *Fine Chemicals*

GENERAL CHEMICAL DIVISION
Allied Chemical & Dye Corporation
40 Rector Street, New York 6, N. Y.

Offices: Albany* • Atlanta • Baltimore* • Birmingham* • Boston* • Bridgeport* • Buffalo* Charlotte* • Chicago* • Cleveland* • Denver* • Detroit* • Houston* • Jacksonville • Kalamazoo Los Angeles* • Minneapolis • New York* • Philadelphia* • Pittsburgh* • Providence* St. Louis* • San Francisco* • Seattle • Yakima (Wash.)
In Wisconsin: General Chemical Company, Inc., Milwaukee
In Canada: The Nichols Chemical Company, Limited • Montreal* • Toronto* • Vancouver*

SETTING THE PACE IN CHEMICAL PURITY SINCE 1882

*Complete stocks carried here

REAGENTS B&A STANDARD OF PURITY FINE CHEMICALS

leum cuts (such as extracts from sulfur dioxide treatment of cracked gas oil and kerosene) which are converted to specific aromatic hydrocarbons. These, in turn, are converted via a one-step alkylation-sulfonation process to a mixture of alkyl aryl sodium sulfonates which are said to be better than a pure compound for many applications.

Initially produced as a 50 percent active, free-flowing liquid, Udex can be easily drum or spray dried to a 90-95 percent active powder. In carloads, the powder is priced at 25c./lb., the liquid at 7½c./lb.—*Universal Detergents, Inc., Long Beach 6, Calif.*

Hot-Cold Lubricants

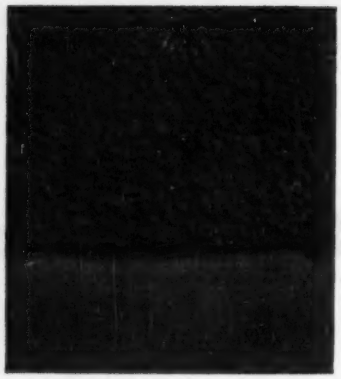
Can be used over wide temperature range; new type replaces as many as four existing grades.

Four oil companies have announced new, all-weather lube oils and greases. This means that it will no longer be necessary to change oil every time the weather changes. And also, since the new brands are designed to replace up to four existing grades, inventory problems will be reduced for both the retailer and the manufacturer.

• Gulf Oil Corp. has named its product Gulfpride H. D. Light. Recommended for use wherever temperatures below 10 deg. F. are likely, it permits easy starting down to −30 deg. F. Yet on warm winter days there is no danger of inadequate lubrication. H. D. Light will completely replace Gulf's 5W and 10W grades, and its characteristics—148 viscosity index and −40 deg. F. pour point—are good enough for it to be used instead of grades 20W and 20.

• Standard Oil Co. (Ind.), with Permalube Motor Oil SAE 5W-20, and Mid-Continent Petroleum Corp., with D-X Special, have oils similar to the Gulf product. Both oils are recommended for use at temperatures where SAE 5W, 10W, 20W and 20 are now being used.

• The Texas Co. has come up with a grease which performs effectively in desert or arctic operations. Called Texaco All Temp Grease, the product efficiently lubricates in ambient temperatures from −65 to 125 deg. F. This should be a help in logistics problems involving transportation of vehicles from extremely cold to extremely hot locations.



Nonskid Floor Paint

Will prevent many industrial accidents which now result from slippery floors.

Now you don't have to use a trowel to apply nonskid floor paints. Sure-Grip, a plastic liquid into which is incorporated a large amount of hard grit, can be brushed on floors to safety-proof them.

Originally developed to assure safe-footing on the decks and ramps of ships and landing craft, the new paint is many times thicker than conventional floor paints. And because its surface is rough (see *cut, top*), Sure-Grip sets up traction that prevents falls even when wet.

No primer is required, and it's equally effective over wood, metal or concrete. Drying time is 10 hours at room temperature and coverage is 75-100 sq. ft./gal.—*Colonial Refining & Chemical Co., N.B.C. Building, Cleveland, Ohio*

Release Agent

For removing epoxy resin products from metal or plaster molds.

Epoxy resins, noted for their ability to bond metals, glass and ceramics (see *Chem. Eng.*, Sept. 1953, p. 380), tend to stick to mold surfaces and are hard to release after laminating and casting operations. This problem can be solved by using a new release agent, H-561-B, which replaces conventional waxes and silicone resins.

After application to mold surfaces, the agent is ready for application of resins within a few minutes. It is said to be especially effective with low-temperature-setting, amine-hardening types of epoxies. — *Furane Plastics 4516 Brazil St., Los Angeles 39, Calif.*

Briefs

Two non-leafing aluminum pastes, MD 584 and MD 784, are now available for use in protective coatings. Being non-leafing, the pigments carry a grease film of such a nature that the flake will not leaf or flow when formulated in a paint. This makes possible uniform dispersion of the pigment.—*Metals Disintegrating Co., Inc., Elizabeth B, N. J.*

Liquizinc, a highly concentrated, dispersible zinc stearate, is now in commercial production. It is recommended as an anti-tack agent which is absorbed in rubber milling and compounding operations, thus allowing stock to run cooler and smoother.—*Rubba, Inc., New York 60, N. Y.*

This new series of lauryl sulfates should fill the need for good fatty alcohol sulfates of consistent quality, but at lower prices than cosmetic grades. The salts offered are: sodium, magnesium, potassium, ammonium, mono-, di- and triethanolamine.—*American Alcolac Corp., Baltimore 26, Md.*

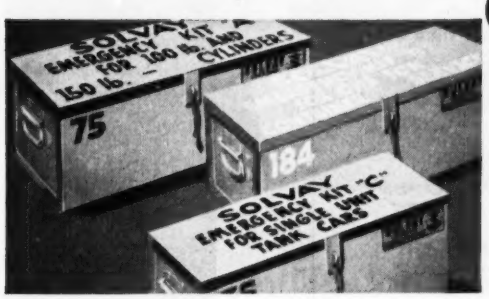
A new refined vegetable wax, similar to Carnauba, has been introduced to the American market. Called Durango-Wax, it is obtained from double-refined candelilla wax by extracting those resins which previously have been drawbacks in the manufacture of carbon paper and polishes. This improves abrasion resistance and makes products manufactured from the wax more stable. Durango-Wax melts at 167-169 deg. F. and has an iodine number of 9.—*Candelilla Industrializada, S. A., Gomez Palacio, Durango, Mexico.*

A self-molding packing compound, called Molyvec, has been developed for valves and pumps operating under negative pressure. Said to be the densest compound made for such services, it maintains sustained sealing efficiency at temperatures ranging from −30 deg. to 500 deg. F. Other formulations are available for lower temperatures.—*Surveys, Inc., 219 Euclid Ave., Trenton 9, N. J.*

When you buy SOLVAY® CHLORINE you get these 3 EXCLUSIVE SOLVAY SERVICES

① A Specialized Technical Service for Each Industry

Only SOLVAY offers you a Technical Service with separate sections for textile, paper, water, sewage and other industries that use chlorine. SOLVAY'S staff of engineers, chemists and technicians are available AT NO COST OR OBLIGATION!



② Exclusive Chlorine Safety Service

Solvay has been a leader in the development of safety programs for chlorine users. SOLVAY customers can obtain SOLVAY'S Safety Charts which instruct employees on safety practices . . . procedures to follow in an emergency . . . and the location of the nearest SOLVAY repair kits. SOLVAY also makes available its *exclusive* emergency repair kits which have been specially-designed by SOLVAY engineers to quickly and safely stop chlorine leaks from any type of SOLVAY Chlorine container. These kits may be purchased by SOLVAY Chlorine users . . . or they may be borrowed *without charge* at various points throughout the country in an emergency. Booklets describing these kits with detailed instruction on their use are supplied *at no cost* to *all* users of SOLVAY Chlorine.

③ Technical Bulletin Service

SOLVAY's *exclusive* series of Chlorine technical bulletins are recognized as one of the most highly reliable sources of information on chlorine and its uses. These bulletins are: Bulletin #7, "Liquid Chlorine," Bulletin #8, "Alkalies and Chlorine in Treatment of Municipal and Industrial Water," Bulletin #11, "Water Analysis," Bulletin #12, "The Analysis of Liquid Chlorine and Bleach," Bulletin #14, "Chlorine Bleach Solutions."

When service is a prime factor—make SOLVAY your prime source!

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Soda Ash · Caustic Soda · Potassium Carbonate · Calcium Chloride · Chlorine · Caustic Potash · Sodium Nitrite Cleaning Compounds · Ammonium Bicarbonate · Sodium Bicarbonate · Snowflake® Crystals · Monochlorobenzene Para-dichlorobenzene · Ortho-dichlorobenzene Ammonium Chloride

SOLVAY PROCESS DIVISION, Allied Chemical & Dye Corporation
61 Broadway, New York 6, N. Y.

Gentlemen:
Please send me—AT NO COST OR OBLIGATION— copies of these SOLVAY Technical Bulletins: ☐ #7 ☐ #8 ☐ #11 ☐ #12 ☐ #14

Please have the nearest SOLVAY Branch Office contact me regarding:
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A FAIR OFFER

If you will put a Jenkins Valve, recommended for your particular service, on the worst place you can find — where you cannot keep other valves tight — and if it is not perfectly tight or it does not hold steam, oil, acids, water or other fluids longer than any other valve, you may return it and your money will be refunded.

Jenkins Bros

A FAIR OFFER THAT HAS BEEN IN EFFECT SINCE 1869

JENKINS VALVES

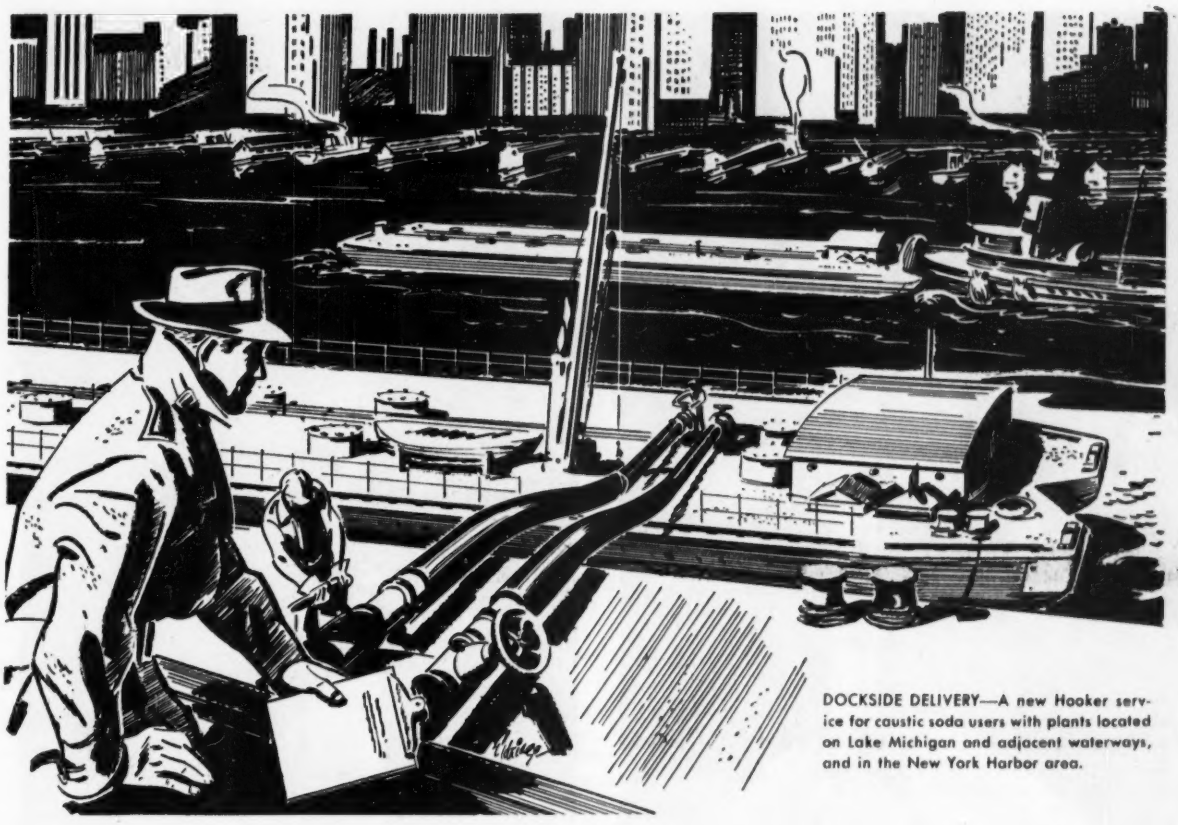
LOOK FOR THE DIAMOND MARK

SINCE 1864 TRADE JENKINS MARK

Jenkins Bros

This famous "Fair Offer" has been published at frequent intervals for the past 84 years. It can be repeated, again and again, only because all jenkins Valves measure up to its sincere pledge of exceptional dependability.

Despite their *extra value,* proved by countless economy records in every type of service, *you pay no more* for Jenkins Valves. Jenkins Bros., 100 Park Ave., New York 17.



DOCKSIDE DELIVERY—A new Hooker service for caustic soda users with plants located on Lake Michigan and adjacent waterways, and in the New York Harbor area.

For safe, sure, consistent results . . .
STANDARDIZE on Hooker Caustic Soda

Why this is important to you:
With *uniform* caustic soda coming in, shipment after shipment, you can standardize your caustic handling and processing.

You need not adjust your process to meet variations in incoming caustic shipments. You can be sure each new shipment matches your current inventory.

You get this kind of uniformity with Hooker Caustic Soda. Every step in the manufacture—from salt brine to tank car—is controlled at Hooker, by Hooker. More than 20 separate inspections and analyses safeguard the uniformity of the Hooker Caustic you buy.

This is one reason why leaders in 30 industries specify *Hooker* Caustic—and why many have specified it for nearly 50 years.

Hooker uniformity can pay off for you, too—in lower operating costs and smoother, better processing. Try it and see. A letter or phone call to the nearest Hooker office will bring you product data and contract information.

Buy the UNIFORMITY Hooker Caustic Soda gives you

Forms: Liquid 50% and 73% • Flake • Solid • Special fine flakes
Containers: Tank cars • Tank wagons • Barges • Drums

For fast service, phone:

CHICAGO	CEntral 6-1311
LOS ANGELES	NEvada 6-3826
NEW YORK	MUrray Hill 2-2500
NIAGARA FALLS	6655
TACOMA	BRoadway 1215

HOOKER CHEMICALS

3-1764

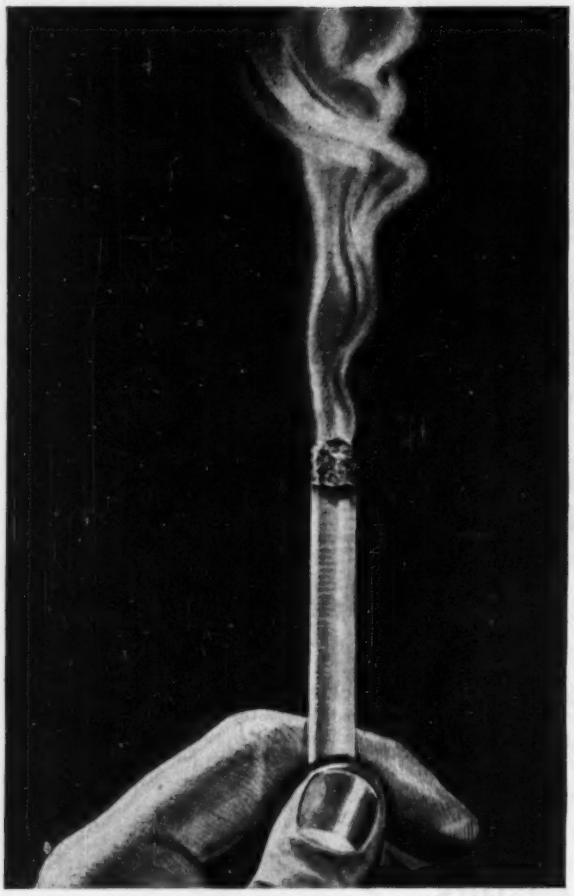
From the Salt of the Earth

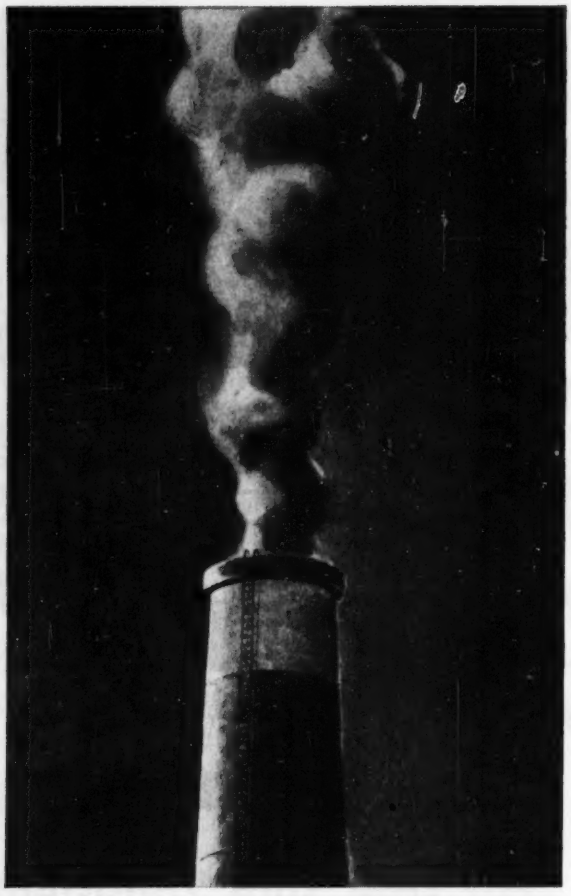
HOOKER ELECTROCHEMICAL COMPANY

HOOKER ELECTROCHEMICAL COMPANY
5 Forty-Seventh St., Niagara Falls, N. Y.

Please send ☐ data sheets on Hooker Caustic Soda; ☐ Bulletin 100 describing Hooker products and services.

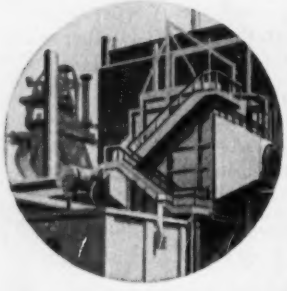
Name..... Title.....
Company.....
Address.....
City..... Zone..... State.....





What do these two 'smokes' have in common?

THE SMOKE PARTICLES that cigarette filters attempt to trap are often as small as one 2 millionth of an inch.



Gases generated in industrial processes contain particles as minute as these—in addition to many a good deal larger. And, particularly in cases where a range of microscopic particles is involved, tests show Koppers-Elex Electrostatic Precipitators to be the most effective and efficient means of achieving these three benefits:

FIRST—recovery of valuable materials entrained in process gases.

SECOND—cleaning of gases for subsequent re-use.

THIRD—control of discharge gases well within the limits set by nuisance abatement laws—vital in maintaining good public relations in industrial communities.

Koppers precipitators can work at almost 100% efficiency . . . and operate *continuously*, too. Koppers multiple-chamber design permits the gas-cleaning operation to continue uninterrupted in one chamber while another is undergoing inspection or maintenance.

Koppers-Elex precipitators are designed, engineered, fabricated, erected, and guaranteed under one contract by the Koppers Company. For analysis and recommendations relating to your operation, submit details without obligation to: KOPPERS COMPANY, INC., *Precipitator Department*, 313 Scott Street, Baltimore 3, Maryland.

GUARANTEE: All Koppers-Elex precipitators are guaranteed to meet your specifications for efficiency or residual content.

KOPPERS®

ELECTROSTATIC PRECIPITATORS

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC., BALTIMORE 3, MD.

This Koppers Division also supplies industry with Fast's Couplings, American Hammered Industrial Piston and Sealing Rings, Aeromaster Fans, Gas Apparatus.

Engineered Products Sold with *Service*

STOP TRAMP IRON
with ERIEZ Magnetic Pulleys

Most Every Industry Uses ERIEZ Pulleys to REMOVE TRAMP IRON . . . Prevent Machinery Damage . . . STOP FIRES and Solve Product Purification Problems

THE redesigned patented line of ERIEZ *improved*—Permanent Pulleys makes available the most efficient, powerful and economical automatic installation for separating magnetic from non-magnetic materials conveyed on a belt.

With an ERIEZ Permanent Pulley you have no operating cost, no maintenance, no electric power required. ERIEZ Pulleys will perform, at top efficiency, under operating conditions of high or low temperatures and on wet or dry materials!

ERIEZ' complete line has a pulley for your exact need.

Extremely rugged construction, lined with powerful Alnico V, assures you the utmost in structural as well as magnetic strength.

Permanent Non-Electric ERIEZ Pulleys can never fail . . . electrical system failure will no longer endanger or stop your operation.

Top working efficiency is assured through belts of rubber, canvas, stainless steel or any other non-magnetic material.

Low installation cost . . . merely drop the shaft into the bearings and put on the caps.

Here's low cost, uninterrupted protection from tramp iron for costly crushers, grinders, pulverizers, stokers, etc.

Here's What Users Say . . .

ERIEZ installation at Fertl-Soil Company, Rahway, N. J., is removing 25 pounds of tramp iron from each ton of raw material processed!

"Operation without the ERIEZ Pulley would now be unthinkable," says James Smith of the Fertl-Soil Company. "Preventing machinery damage saves us about $1,000 annually, elimination of shutdowns saves another $3,000 a year, and man hours saved averages $1,200.

"We used mechanical separating devices in the past, but this ERIEZ Magnetic Pulley has proved to be by far the most positive and satisfactory means of eliminating tramp iron from our product."

The high degree of attraction o the magnetic pulley is shown in this operation where ramp metal is held firm until carried out of the magnetic field by the conveyor belt. The fertilizer being processed then drops into a mill for grinding and the ferrous contamination passes onto the chute back of the pulley. This installation assures protection to processing machinery and delivery of a clean finished product.

New Permanent Magnetic Super Sweeper Keeps Lots, Roadways, Factory Aisles, etc. Free of Dangerous Tramp Iron

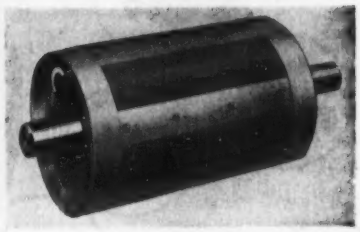
Here's a streamlined, powerful magnetic sweeper designed to pick up and hold dangerous tramp iron from large areas, helps to keep areas clean and safe, reduces accidents, tire punctures, etc.!

PUSH IT • PULL IT • SUSPEND IT!

Entirely new, fast cleaning principles make SUPER SWEEPER a natural for cleaning even the largest areas in a short time. It can be used by most everyone! Removes nails, etc. from parking lots, garages, warehouses and terminals . . . cleans factory floors of metal shavings, chips, etc. Removes tacks, staples, etc. from floors of manufacturers . . . ideal for foundries, contractors, platers, etc. Want more information—fill out and mail the handy coupon at right.

FOR INDOOR OR OUTDOOR USE . . .

Versatile in design, it can be used indoors or out . . . four sizes in three magnetic strengths for medium, heavy and extra-heavy duty tramp iron removal are available with all attachments for manual or mechanical operation. SUPER SWEEPER is quickly cleaned by turning magnetic face up with handle and stripping the metal accumulation from the sturdy neoprene cover. It has been designed for indoor or outdoor use . . . you can pull it, push it or suspend it!!!



New Patented *Improved* Designs Afford . . . Greater Protection Than Ever Before!

From ERIEZ, the pioneer and original producers of the permanent non-electric magnetic pulley, come redesigns and improvements which make the most efficient, versatile line of permanent magnetic pulleys available. Years of engineering, manufacturing experience and testing have gone into the new *improved* ERIEZ Magnetic Pulleys. 80 *improved* standard sizes with capacities from 50 to 18,600 cu. ft. per hour are available for prompt delivery . . . added to this any number of special widths and shafts are available to meet your exact requirements. For peak efficiency, dependability and power, install an *improved* ERIEZ patented Permanent Pulley.

Write for New, Free 2-Color Bulletins . . .

Fill out and clip the handy inquiry coupon below and we'll send you all available information on these products. Bulletin 501 is a six-pager packed with technical information, photos, dimensions, etc. on the entire pulley line. Bulletin 555 fully describes ERIEZ versatile new Magnetic Super Sweeper. Get your copy by return mail.

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ERIEZ MANUFACTURING COMPANY
74A MAGNET DRIVE • ERIE, PA.

Name .....

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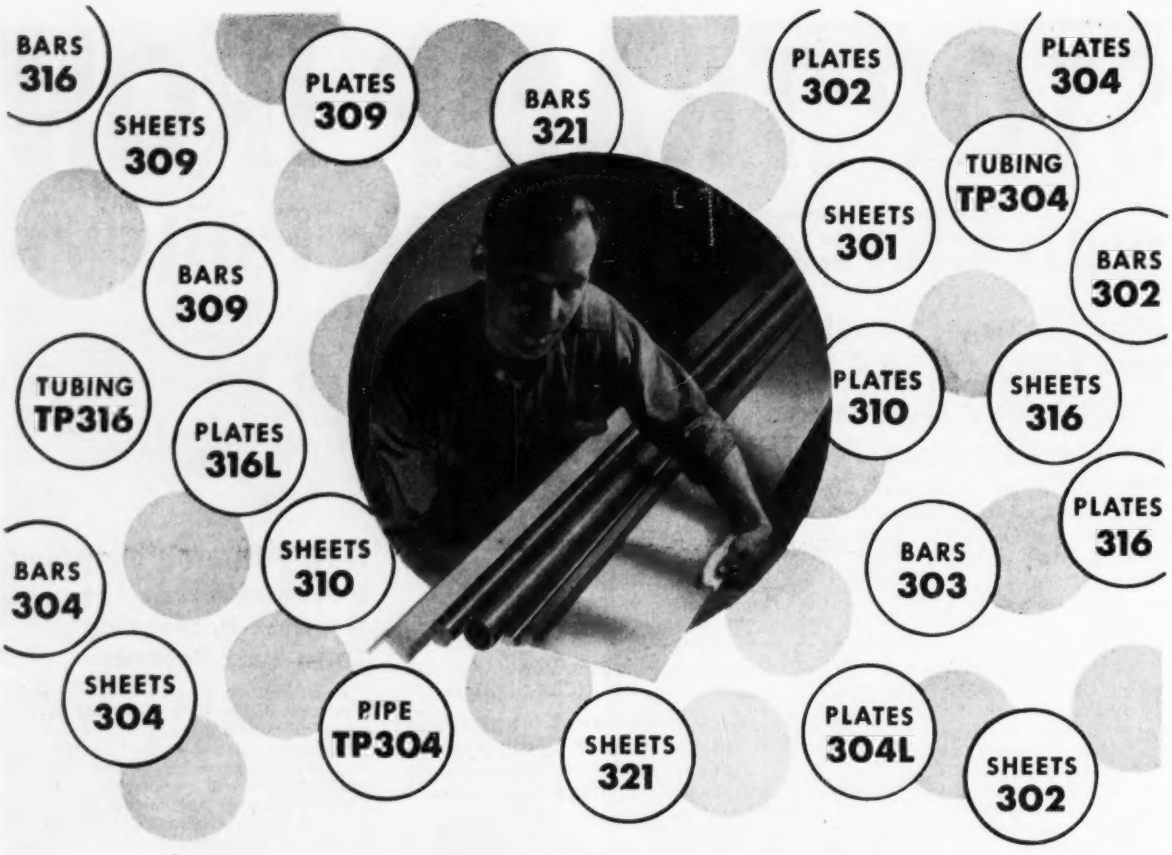
Sales Offices throughout the United States

• *Please send me*

☐ PULLEY BULLETIN 501

☐ SWEEPER BULLETIN 555



Nickel-Bearing Stainless

Large stocks . . . quick shipment . . . for any use!

Once more—without any red-tape—you can get all the nickel-bearing stainless steel you want from Ryerson. And get it fast, too!

Ten different types are immediately available from stock—in sheets, plates, bars, tubing or pipe (see circles above). Many new sizes and types have been added. And it's all time-tested Allegheny stainless steel.

Of course, we also continue to carry straight chrome stainless in a wide variety of types, shapes and sizes for applications where the more expensive nickel-bearing types are not needed. So you can depend on Ryerson for *complete* stainless service—including the practical assistance of Ryerson stainless specialists in selecting the right type for the job or in solving difficult fabrication problems.

For quick delivery of anything in stainless just call your nearby Ryerson plant. And you save time—avoid inconvenience by having all your other steel requirements included in the same delivery.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot & cold rolled, many types & coatings
TUBING—Seamless & welded, mechanical & boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated
STAINLESS—Allegheny bars, plates, sheets, tubes, etc.
REINFORCING—Bars & Accessories, spirals, wire mesh
BABBITT—Five types, also Ryertex plastic bearings
MACHINERY & TOOLS—For metal fabrication

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND • DETROIT
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RYERSON STEEL

Chemical Engineering
JANUARY 1954

Something New for 1954

How you helped to bring about a novel improvement in the publishing business. And what it is going to mean to you.

This issue of *Chemical Engineering* has several innovations. One is worth calling to your special attention, since it is a basic improvement we've been working toward for several years.

This is an entirely new layout or arrangement of editorial departments and advertisements. Its net effect is to cut down on the mixing of editorial and ads on the same page, thus to concentrate editorial material.

You'll notice, for instance, that well over the first half of this issue has only full-page editorial and only full-page ads—the two are never mixed on the same page. This is in sharp contrast to the prevalent practice of many publications—and to our own past practice—of intimately mixing editorial departments and advertising throughout each issue.

But you'll also notice that an entirely different arrangement begins on p. 380—the so-called "split-page" section that consists of pages "split" between editorial and advertising. You'll see, though, one important change: These "split" or fractional editorial pages are now concentrated into a relatively small area rather than being "strung out" through most of the magazine.

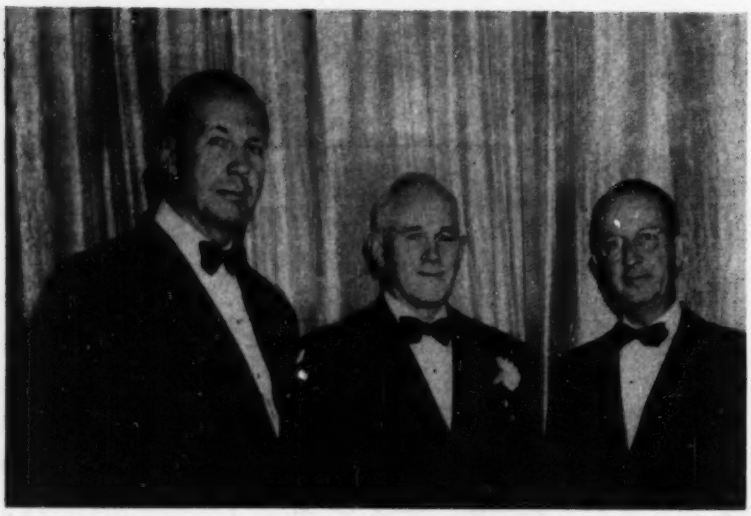
These changes called for a rearrangement of editorial departments. The so-called "full-page" section contains the more technical departments that have considerable permanent reference value and are apt to be clipped or saved. The so-called "split-page" section contains those editorial departments that have a very high—but largely temporary—value as news.

We're making these changes for one reason: You've convinced us—convinced us beyond any doubt—that they will lead to better and more thorough reading of both advertisements and editorial pages. Many of you have long pointed out that the excessive mixing of ads and editorial on the same page detracts seriously from your close reading of either.

We believe this to be the first action by any publication in the chemical field—or in any field, so far as we know—to resist and perhaps reverse the trend toward greater and more intimate mixing of editorial and advertising on the same page. It was made possible only through the understanding and cooperation of all our advertisers and their agencies.

You'll now find *Chemical Engineering* an easier and more pleasant magazine to read, to use and to save.

John R. Callaham



Principal speakers at the Chemical Engineering Award dinner: W. C. Foster, president, Manufacturing Chemists Association; J. G. Davidson, president, Carbide and Carbon Chemicals Co.; W. G. Whitman, chairman, Committee of Award.

Carbide's Achievement

An audience of 750 attended the banquet in the Bellvue-Stratford Hotel, Philadelphia, Dec. 2 to present the 1953 Award for Chemical Engineering Achievement to the Carbide and Carbon Chemicals Company.

PRESENTATION
Walter G. Whitman

As the representative of a selection committee comprising senior professors of chemical engineering from over 75 colleges and universities across the country, I deem it a high honor to speak for such a group of judges.

The selection of one organization from among the many that have been making outstanding contributions becomes increasingly difficult. Chemical process industries as a group are virile and confident in their approach to the future. It is therefore most significant that, for the first time, the award is being made to a company which has once before been so recognized. Just twenty years ago the first plaque to be awarded was presented to Carbide for its development of a synthetic aliphatic chemicals industry from national gas.

Now we are honoring an achievement which pioneers the commercial production of a host of aromatic chemicals by the hydrogenation of coal.

Dr. Davidson—I am privileged to present through you to the men and women of Carbide and Carbon Chemicals Company this twelfth Award for Chemical Engineering Achievement.

ACCEPTANCE
J. G. Davidson

Thank you, Professor Whitman. It is with great pride that I accept this award on behalf of the people of Carbide whose work has made our coal-hydrogenation project a reality. I would like to thank also McGraw-Hill and *Chemical Engineering*, who made possible this coveted honor, and the distinguished members of the Committee of Award.

Twenty years ago, but under very different circumstances, Carbide and Carbon Chemicals Corporation was the recipient of the first plaque awarded for chemical engineering achievement. The meeting was held in Room A of the Chemists' Club in New York which, as most of you know, holds at the most about thirty people.

The plaque, which I have here to my left, states it was awarded because of our pioneering efforts in the field of synthetic aliphatic organic chemicals.

In 1933 the value of products in this classification amounted to about $20 million. In 1952 they totalled some $2,700 million and the best accolade that could be given to the industry is that although we started out alone, we now have plenty of competitors, both large and small. What is more important, there are literally thousands of medium-sized companies who have been able to build up a business because of these new products.

For the last fifteen years we have been concerned with the situation in the field of aromatic chemicals. Historically, these products have been produced from coal tar, which in itself is a byproduct of the byproduct coke industry. That in turn is dependent upon the steel industry and while in terms of dollars the steel industry has been expanding rapidly, percentage wise it has not been expanding nearly as fast as has the demand for aromatic chemicals. The shortage has been made up in part by the petrochemical industry. Benzene, toluene and the xylenes have been produced from petroleum in large quantities but the processes are rather expensive and in any event they do not yield the higher members of the groups. It is well known, of course, that the Germans and British had produced gasoline and fuel oils by the hydrogenation of coal but in our estimation that process is entirely uneconomic in the United States at the present time.

Our studies indicated that the production of aromatic chemicals could be achieved through the hydrogenation of coal but under quite different conditions from those employed by the Germans and the British. In the first place, the pressures we employ are not as high and the quantities of hydrogen are not as great. The very carefully controlled conditions under which we work yield us much higher percentages of the higher members of the various groups than could be obtained from coal tar which, after all, is a residue product. For example, our process yields infinitely more aniline than is extracted commercially from coal tar, 5-8 times as much naphthalene, 60-80 times as much phenol and for some specific products such as

quinoline and indole, our yield is 300-500 times the yield from coal tar.

We are today, with respect to the production of aromatic chemicals from coal, just about where we were with respect to aliphatic chemicals from gas and oil twenty years ago.

We have built a large pilot plant at a cost of some $11 million and in addition, have spent some $8-9 million on research and development, so our total expenditures to date are about $20 million. Only under a system of free enterprise could any corporation afford to make such an investment. We believe that any government subsidies to research and development projects such as this not only would discourage adequate private interest and investment, but might increase the cost and delay ultimate accomplishments.

In the laboratory it is frequently possible to run two or three experiments a day in a pilot plant. But our present "pilot" plant in West Virginia is so large that only two experiments a month can be carried out, and that is just what we have been doing for the last year and a half since the plant was built. We are trying to find the optimum conditions under which to work so when a larger plant is to be built, we will know just how to obtain the greatest yield of the desired products.

All this I hope will come to pass within the next few years. Over the next twenty years I confidently expect to see the aromatic chemical industry based on coal, develop to great stature in the United States. With it, as was true once before, will come better things that will help to raise the standard of living and make our country a better place in which to live.

THE SINGLE ROAD

William C. Foster

One might ask if there is any single road to our objective, security and abundance? I believe so, and I believe that the talents of the laboratory, plant and office that we honor tonight suggest how this may be so. For my point is that the combination of security and abundance depends not so much upon resources as it does upon resourcefulness.

We face a long-time shortage of natural resources. But in my opinion we shall one day look back upon it as an unexpected blessing. First, it is compelling us to take an interest in some of the areas of the world from which we must draw certain of our key materials. In large measure they are what we call "under developed areas." Many indeed most—of the peoples of those lands are today filled with a yearning and indeed a revolutionary determination to improve their lot. They look with comparing eyes at our democratic society and at the Communistic society of Russia, to see how well each system serves the people who live under it. As we exert more or less benevolent influence on those people, as we improve trade and develop wider and sounder relationships, we automatically give them insight into our motives and acts and draw them nearer to us. We thereby improve the conditions requisite to peace. That's one potential blessing.

Another is that a shortage of materials will compel us to use what we have to better advantage. We are still too wasteful.

Just these two items point to the need for further improvements in technology to reduce waste.

Our minds have been so focused on the destructive uses of atomic power that we are only now beginning to see what may possibly lie ahead. However, if our vision is not yet too sharp, we may take some comfort from the fact that only 27 years ago we didn't know much about what we could do with oil.

From an experimental 75 tons of chemicals from oil produced by one company in 1925, we today find yearly production of chemicals from petroleum and natural gas running 8,500,000 tons, ever on the rise and ever giving us a new abundance of materials. The company we honor tonight has been a great pioneer.

Until a few months ago many supposed that the great future of chemicals would be most largely realized in the field of petrochemicals. This was so despite the fact that coal had always been the base on which our industry was built. But the coal tar we needed was really a byproduct of the steel industry and such has been our expansion that we were running out of those materials. Oil promised to supply the answer.

Then suddenly last spring we heard that down in West Virginia a modern industrial marvel had been brought about. By a whole series of inventions and new techniques the process of hydrogenation of coal had been cut from the 45 min. previously required, even in the best German plants, to about 4½ min.

The prospects for these coal chemicals seem almost unlimited. Many, many new uses will be found, and through this demonstration of resourcefulness a whole new way of adding to our resources has been uncovered. Certainly, an immense potentiality has been opened to us by the men who developed the process.

Management, too, made quite a contribution to this significant achievement. As I noted earlier, management gave the green light to these experiments 17 years ago, in 1936. As I recall it, that was a year in which none of us felt too sure of ourselves.

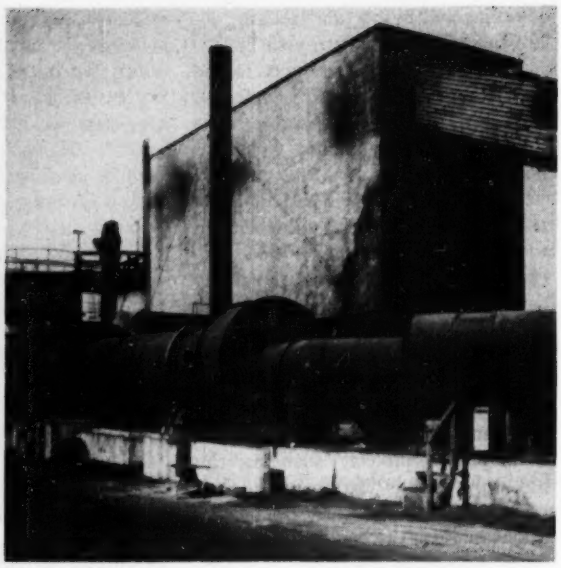
Only a company that expected to remain in business, to grow and enjoy larger markets would have felt impelled to undertake a massive research project to find a substitute for oil. I doubt whether we could ever have persuaded a government bureau, or Congress, that financing such a project back in 1936 was a wise thing.

True, our government entered this hydrogenation field later, but that was under the war-emergency conditions, and it was an effort having inconclusive results. The Hitler government invested heavily, with results that were satisfactory to them, although uneconomic by any sane standard.

I believe it to be safe to say that this investment by Union Carbide and Carbon was the only major private money spent on development of coal hydrogenation in the past 40 years. And it is the only investment so far that has the prospect of paying off in terms of good things for masses of people and profit for the developer.

Our resourcefulness will be remembered long after our resources are forgotten. Granted peace abroad, and granted freedom from undue restriction at home, our industries—with chemicals in the lead—will come up with countless examples of beneficent resourcefulness, such as that we honor tonight. There will be inspiring examples of technical skill, and management vision, and each in its way will be a paving stone in the single road to security and abundance.

PREPARING low-grade ore for the process involves jaw-crushing and grinding to a particle size of about —20 mesh.



CALCINING the ground ore in a reducing atmosphere converts the higher oxides of manganese to acid-soluble monoxide.

From Low Grade Domestic Ores:

How Western Electrochemical has achieved large-scale production of battery-active

ELLIOTT SCHRIER and ROGER W. HOFFMANN

From abundant supplies of low-grade domestic ores, large scale production of high-grade, battery-active manganese dioxide. That's the proud achievement of Western Electrochemical Co.

Their new process takes domestic ores averaging about 20 percent manganese and, by electrodeposition, produces an electrolytic MnO_2 consistantly able to meet the highest Signal Corps specifications. This may mean the end of our reliance on high-grade ores, almost all of which are imported.

IMPORTANCE WELL KNOWN

The use of MnO_2 as a depolarizer for dry cell batteries is well known. It is found in widespread areas of the world, but very few of these deposits are sufficently active or of sufficient purity for battery use.

Although there are some deposits of the battery-active ore in the United States, the only really important commercial deposit is in Africa. It is the uncertainty of this supply, especially in time of war, coupled with the markedly superior depolarizing action of the electrolytic MnO_2 which pointed up the need for large scale production from the lower-grade domestic ores.

STUMBLING BLOCKS ROUTED

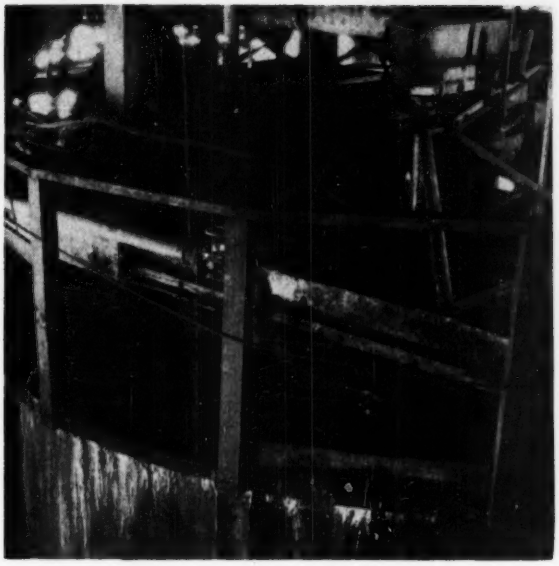
Problems solved by Wecco in the development of a process to fulfill this need were:

- Development of roasting and leaching techniques and equipment to prepare a satisfactory electrolyte from low-grade ores.
- Design and construction of a commercial cell.
- Determination of optimum cell operating conditions.
- Selection of the proper anode material.

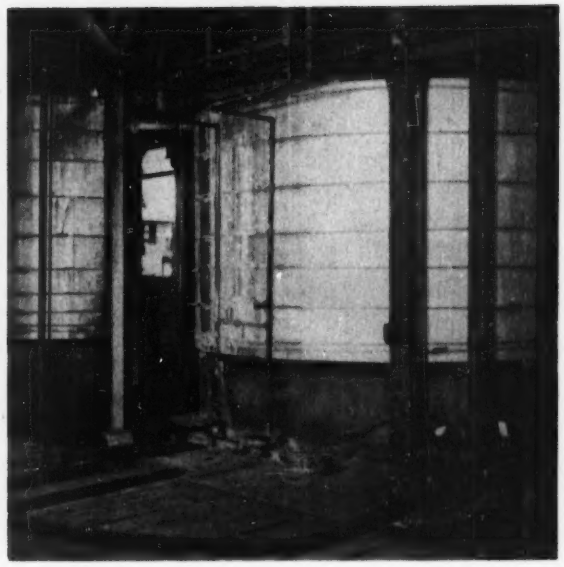
ELLIOT SCHRIER *is the Western Editor of* Chemical Engineering. ROGER HOFFMANN *is assistant to the Director of Research of the Western Electrochemical Co.*

The Process at a Glance . . .

- **Crush and grind the raw ore to —20 mesh.**
- **Calcine to convert the manganese to the divalent form.**
- **Leach with H_2SO_4 to dissolve the metals in the ore.**
- **Decant the solution of sulfates from the insolubles.**
- **Precipitate the heavy metals by treating with BaS.**
- **Settle in a thickener and decant off the clear solution.**
- **Precipitate iron and all remaining impurities by aeration.**
- **Filter to recover pure, ready-to-use cell solution.**
- **Electrolysis deposits electrolytic MnO_2 on the anode.**
- **Separate the deposited dioxide from the anode.**
- **Wash, dry and pack the product for sale and shipment.**



LEACHING with sulfuric acid-containing spent cell solution dissolves the metallic components of the raw ore.



PRECIPITATING the heavy metals with a barium sulfide solution removes most of the metallic impurities.

High Grade Manganese Dioxide

MnO_2 from abundant supplies of domestic ores—thus reducing reliance on imports.

• Development of an economical means for recovering MnO_2 from the cell.

The process finally evolved has been named the Schumacher process, in tribute to the contributions of Wecco's Vice President and Director of Research, Joseph C. Schumacher.

WECCO'S NEW PROCESS–Raw ore to quality product

"Get a purified manganous sulfate solution and you're in business."

As Schumacher puts it: "The manganese ion doesn't remember its ancestry. Get a purified manganous sulfate solution and you're in business—regardless of the source of the ore." Therefore, development of a commercially sound leaching, roasting and purifying operation was one of the most important steps in the entire process.

Ore for the new process is obtained from nearby mines. On entering the process, the ore is jaw-crushed and ground in a hammermill to a particle size of −20 mesh. To convert insoluble higher oxides to the acid-soluble, lower-oxide form it is roasted with Bunker C oil.

Currently, ground ore and oil are mixed in a roaster-feeder. A new plant, based on Wecco's experience, would add the oil, together with ore, an emulsifier and a wetting agent to a ball mill. This would provide more intimate contact between ore particles and reducing agent. After mixing, the mix goes to the reducing kiln.

In the kiln, the ore is roasted at 750 deg. C. Retention time is 20 to 48 minutes. This converts about 98 percent of the higher oxides to the monoxide and prepares the ore for leaching.

Leaching is done with the sulfuric acid solution produced in the cells and fresh, make-up acid. Leach solution contains about 75 g./l, H_2SO_4 and is kept at 60 deg. C. Leach time is 2 hr.

PURIFYING THE SOLUTION

Purification of the crude electrolyte solution is the next step. As it happens, almost all of the objectionable impurities in the crude solution form insoluble sulfides.

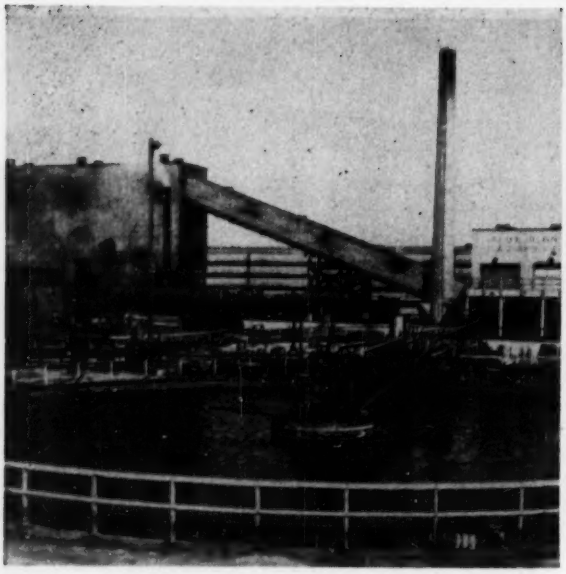
The pH of the crude electrolyte is adjusted to between 3.0 and 3.5 before adding the precipitating agent, BaS. Barium sulfide treated solution is sent to a thickener and CaO added. This adjusts the pH to between 7.2 and 7.5 and improves settling of the heavy metal sulfides.

While precipitating impurities some iron and some manganese will also precipitate, even though the solution pH is below that theoretically required.

Once precipitated, iron sulfide and manganese sulfide are hard to redissolve. To minimize this loss, settled sludge is recirculated.

Iron removal (and the removal of colloidal sulfur, arsenic, and sundry

FOR A PICTURED FLOWSHEET OF THIS PROCESS SEE PAGES 372-5



SETTLING the precipitated heavy metals out of solution prepares the solution for aeration to remove remaining impurities.

SUPPLYING the current necessary for electrodeposition of the battery-active MnO_2 is the function of the copper bus bars.

organics by occlusion) is accomplished through the oxidation of these materials by aeration. Wecco uses three aeration tanks, held respectively at pH 5, 6 and slightly more than 7. This gives a rapid-settling, easily-filtered precipitate.

A rotary filter removes settled iron and other impurities. Clarified solution sent to the cells.*

THE FINISHING TOUCHES

In the cell, high-purity MnO_2 is deposited on the anode by electrolysis. At the end of the plating time, both anode and deposited dioxide are taken from the cell and crushed in a jaw-crusher. Graphite and MnO_2 are separated in a metallurgical jig and entrained H_2SO_4 neutralized. The MnO_2 is then ground to 95 percent −100 mesh, and 65 percent −200 mesh.

The product is washed, filtered and dried in a rotary dryer. Drying temperature is kept as low as possible, since the battery-active, gamma phase may be transformed into non-battery-active, alpha phase above 350 deg. C.

In the final step of the process, the product is packed in drums for sale and shipment. And thus far Wecco has found little trouble in selling it.

*The Bureau of Mines Experimental Station at Boulder City, Nev., also did a great deal of earlier work on the preparation of a purified $MnSO_4$—$(NH_4)_2SO_4$ solution.

SUCCESS STORY—How the Process Was Developed

"The Signal Corps took the initiative. The final result? Better batteries."

In October 1949, Wecco undertook the development of a process for large-scale production of MnO_2. The following year the entire U. S. output totaled only 1,100 tons, about 2 percent of the nation's requirement. All of this came from Africa ore.

Vast reserves of low-grade ores scattered throughout the U. S. and the lack of a satisfactory means of up-grading them presented a challenge that Wecco could not ignore.

As Schumacher says: "The Signal Corps took the initiative, we followed through. The result? Better batteries."

Wecco began conducting preliminary investigations, and soon constructed a semi-pilot plant at its Culver City, Calif., laboratories. As the new process gave indications of success, development work was stepped up.

Henderson, Nev., was eventually decided upon for the location of a new pilot plant. Henderson was a logical choice from two angles. A nearby mine is the largest and most active of the U. S. ore deposits. And, secondly, idle facilities of the war time Basic Magnesium plant were available and could be adapted to Wecco's process.

DEVELOPMENTS AT HENDERSON

A 1-ton-per-day plant was placed on-stream at Henderson in February 1951. The small plant showed such promise that, it was gradually expanded, with Signal Corp help, to its present capacity of 10 tons per day.

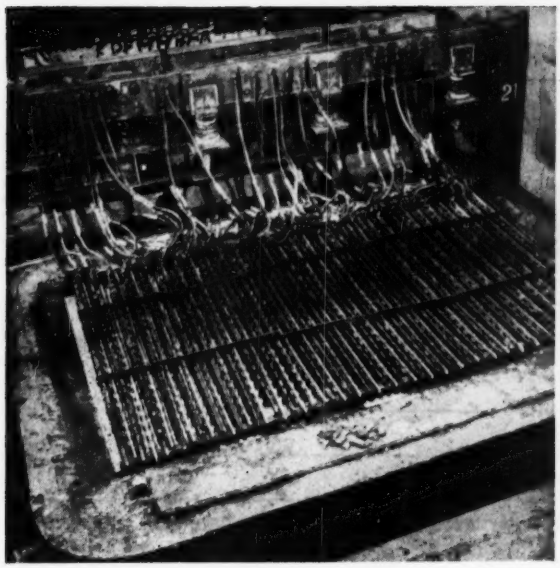
In Wecco's opinion, the plant should be further expanded to keep pace with our growing requirements—which may reach 25 tons per day. Based on knowledge garnered while operating the present unit, Wecco places the cost of a brand new 25 ton per day plant at over $7.3 million.

OTHERS IN THE FIELD

In one way or another a number of other companies have been active in the production of battery-active MnO_2. These include Bright Star, Burgess, National Carbon, Olin Industries, American Metallic Chemicals and, most recently, Harmon Keyes.

America's first commercially produced, electrolytic, battery-active MnO_2 was made by Burgess in the late '30's. Burgess used, and continues to use, electrolytic MnO_2 in its batteries.

Since the war, National Carbon has been running a 2-tons-per-day plant to produce gamma phase MnO_2 from high-grade African ore. The Schumacher process, however, is the first to use low-grade ore on a large scale.



DEPOSITING electrolytic manganese dioxide takes 1 kilowatt-hour per pound of MnO_2 produced. Plating time is 25-35 days.

REMOVING dioxide-laden anodes from the cell reveals the unique rod-shaped electrode, a major innovation in cell design.

THE CELL—Heart of the Schumacher process

"Unquestionably, the new electrode design was the difference between success and failure."

As with all electrolytic process, the heart of the Schumacher process is the cell itself. The present plant consists of 33 cells, each containing 600 anodes and 600 cathodes. However, total anode surface area is 1,000 sq. ft. as compared with 600 sq. ft. of cathode surface area.

The entire 5 x 9 x 4½ ft. cell is lined with acid brick, bound with acidproof mortar. False brickwork on the cell bottom supports the electrodes.

ANODE SHAPE A CELL FEATURE

Key to the success of the Schumacher process is a unique rod-shaped graphite anode. All previous investigations had centered about the conventional plate anode. Early in their investigations Schumacher and his coworkers* confirmed what earlier investigators had found: MnO_2 formed on plate anodes breaks away easily, requiring frequent removal of the anode. And boosting handling costs.

A second difficulty involves the circulation of the electrolyte. Plate type electrodes, it was found, drastically impede circulation.

Both these difficulties were overcome when rods of small cross-section were substituted for the conventional electrodes. Safely past this obstacle, they quickly developed an economic process which attained high deposit-to-rod weight ratios (up to 36 to 1) and long operating cycles.

DIOXIDE DEPOSITED AT ANODE

The over-all cell reaction is

$$MnSO_4 + H_2SO_4 + 2H_2O \longrightarrow MnO_2 + 2H_2SO_4 + H_2$$

the reaction at the anode is

$$MnO + H_2O + H_2SO_4 \longrightarrow MnO_2 + H_2SO_4 + H_2$$

MnO_2 forms as a permeable diaphragm on the graphite rod. Graphite continues to be the active agent, even as the deposit builds up to a thickness of 1 in. or more.

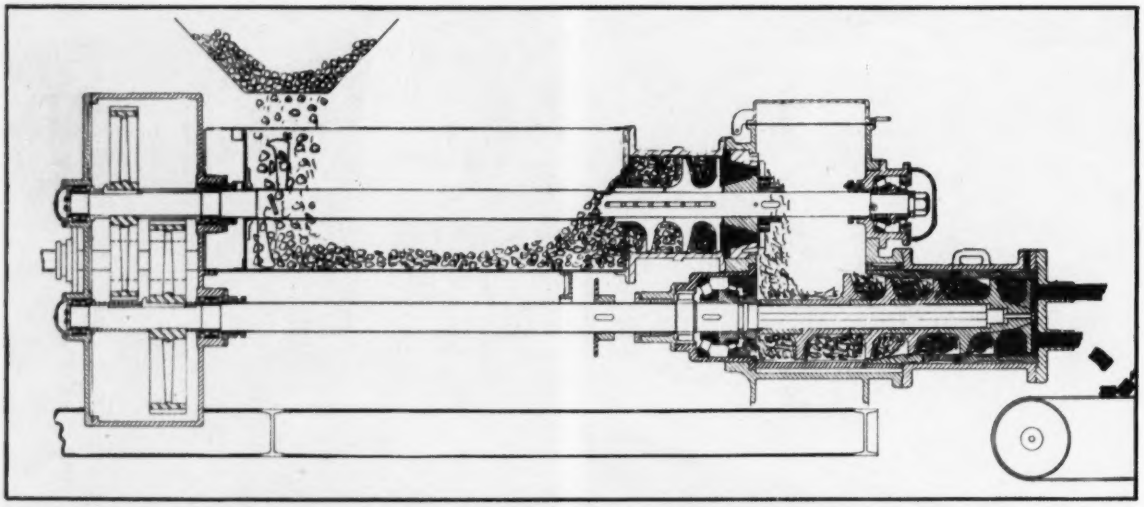
Strictly speaking, therefore, the process is not electrodeposition in the conventional sense. There is probably a secondary effect involving transfer of the electric charge through the pores of the deposited manganese dioxide—not direct contact of ion and anode.

To again quote Schumacher: "We convert manganous sulfate solution into manganese dioxide and sulfuric acid in the electrolytic cell. This transformation probably involves electrochemical oxidation of sulfate to persulfate, and chemical oxidation of manganese from the divalent to the tetravalent state—followed by hydrolysis to MnO_2."

Vital Statistics of the Cell

Current	**7,000–9,000 amp.**
Voltage	**2.2–2.6 v.**
Anode surface area, total	**1,000 sq. ft.**
Anode current density	**7–9 amp./sq. ft.**
Cathode surface area, total	**600 sq. ft.**
Cathode current density	**11.6–15 amp./sq. ft.**
Anode material	**Graphite**
Cell temperature	**90–94 deg. C.**
Plating time cycle	**25–35 days**
Power requirement	**1 kwh./lb. MnO_2 produced**
Deposit-to-anode weight ratio	**up to 36 to 1**

*R. W. Hoffman, F. D. Gibson, L. J. Gibson and R. F. Shurtz.



DEAIRING auger-type agglomerator has an evacuated air-removal chamber between a primary die and an extrusion die.

How and Why Solids Agglomerate

Agglomeration as a step in the process flowsheet is beginning to get more attention. This article sets forth some of the fundamental principles which underlie this long-neglected chemical engineering unit operation.

CARL LUDWIG

Agglomeration, the process of "making big ones of little ones," has been with us a long time. In early times man agglomerated into useful shapes loose fines that nature had fortuitously provided with good plastic molding properties. Later, he identified some of these desirable properties, so that today he agglomerates on a commercial scale many different materials, including sand-like chemicals and minerals which ordinarily don't agglomerate readily.

The most important properties of loose bulks, insofar as agglomeration is concerned, are particle size distribution and plasticity.

PARTICLE SIZE DISTRIBUTION

The number of possible combinations of particle shape and size is virtually infinite, and their behavior is compounded by the surface properties of the materials. This makes it difficult to prescribe the optimum particle size distribution for any agglomeration problem.

Fortunately, in most cases we can formulate some fundamental principles by use of logic or analogy. For instance, when solids are degraded or crushed in a process where all the fractions are collected, then the size distribution of the accumulated fines quite likely corresponds with normal repacking habits. On the other hand, when certain particle sizes are lost in grinding, rejected as tailings, separated as dust, or perhaps missing because the particles were dimensioned by a chemical reaction, then, logically, we must suspect that the size distribution is not the optimum for agglomeration. Lack of micro-size fractions and predominance of uniform sizes are the most frequent faults.

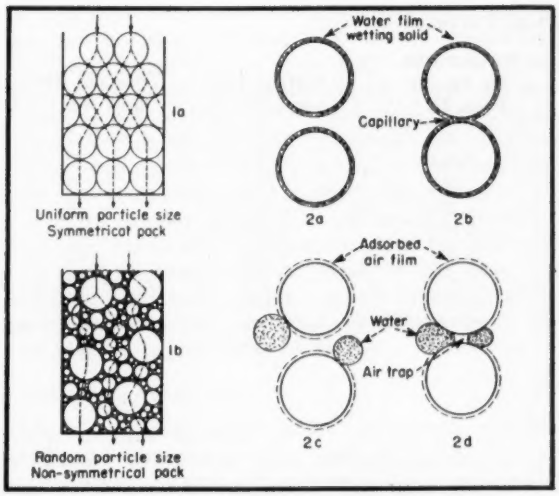
Any size distribution that improves the packing dynamics also contributes to high static strength. In a magnified concept the strength of an agglomerate is patent in the structure of a classic stone wall. Such structures undoubtedly owe their stability to the mechanical interlocks established when the larger rocks are effectively wedged by the smaller ones. Significantly, these ancient walls were put together with relatively low pressures and, in many instances, have endured without help from any cementing binders.

Fig. 1 shows the reason for this. Note that the particle cluster with uniform sizes (a) can be easily divided at the symmetrical and distinct cleavage planes, but the random assembly (b) mechanically resists division because its nonsymmetrical packing habits interrupt or actually interlock the cleavage planes. Regardless of scale—be it rocks or colloidal particles—the cumulative effect of the mechanical locks between particles determines the stability and endurance of the mass.

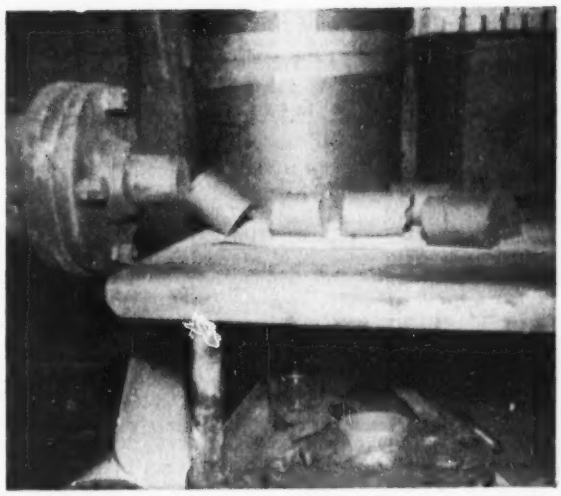
PARTICLE FLOW DURING PACKING

From Fig. 1 we can see also the influence of particle size distribution on packing dynamics. In compression, the weak cluster (a), having a predominance of one size, re-

CARL LUDWIG *is with the Bonnot Co., Canton, Ohio, where he is responsible for the design and development of extrusion and agglomeration machinery for the mineral, ceramic and chemical industries. He formerly was chief engineer of the Adamson Div. of United Engineering and Foundry, working with rubber and plastics machinery.*



SIZE distribution and surface tension effects (Figs. 1 & 2).

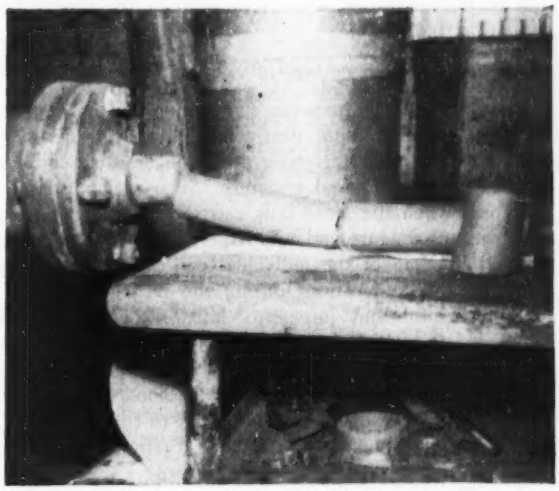


NON-DEAIRED weak agglomerate breaks into short slugs.

solves into a locked or nonyielding truss-like system. It does not easily undergo any molding or compressive flow. Conversely, the random scheme (b), with its serpentine force components, is unstable in compression. This cluster is plastic and can be pushed in combination with similar subassemblies into larger masses.

The foregoing suggests that the preferred particle size distribution involves an optimum surface area or number of contacts between the three average size fractions which best qualify as coarse, medium and fine. This optimum concerns the equilibrium or contained surface contact, not an equal mass of each size fraction.

Since any of several packing schemes may satisfy the preferred geometry, the practical procedure with a new agglomeration problem is to relate the surface areas of the three most typical particle sizes with a previous history of similar substances. With this approach it is important to correlate the particle shapes and—because particle degradation may occur during packing—the crushing strengths of the materials being compared. Observation of simulated packs within a glass graduate, using a low-power microscope, can be quite helpful.

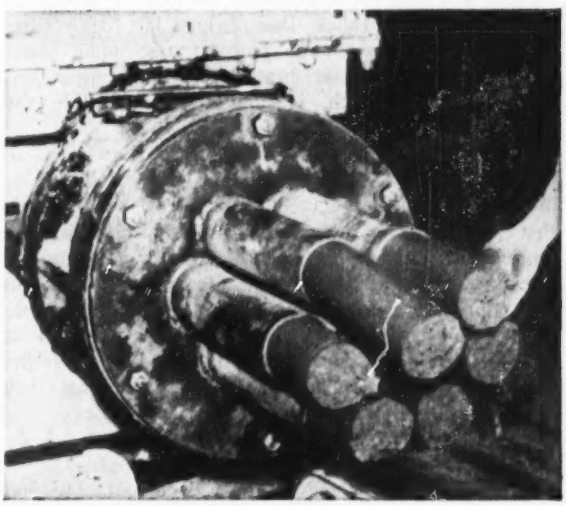


DEAIRED agglomerate's longer slugs show higher strength.

DENSITY CONSIDERATIONS

A high connected void space (low density) favors most gas diffusion reactions, so the ideal particle size preference is at times compromised to emphasize porosity. A pack of uniform sizes, such as Fig. 1(a), can have a 47 percent void space, but by filling the voids with proper shapes we can approach zero porosity. The practical limit is about 8 percent voids, although with colloidal sizes we can sometimes get an even denser body.

Since void-filling ability is primarily dependent on particle variety, we should question any belief that high packing pressures can be used economically to get high-density agglomerates. Of course, any pressure that fractures the particles while packing creates potential void fill, but the probability that the fractured stuff will obediently migrate to the right position is small. More likely, the first crushed fragments will form local bridges which selectively support and dissipate the applied pressure. Of course, extremely high pressures could overcome



IRON ORE is agglomerated using only water as plasticizer.

Table 1—Volume and Surface Relations for Spherical Particles

Sieve No.	Particle Size, Microns	Number of Particles in 6 Cu. In.*	Frequency Ratio, Sieve No. 4 = 1	Surface Area, Sq. In., in 6 Cu. In.*	Surface Area, Acres/Cu. Ft.	Surface Ratio, Sieve No. 4 = 1
4	4,760	1,739	1	192	0.009	1
8	2,380	13,912	8	384	0.018	2
16	1,190	111,120	64	768	0.035	4
30	590	917,990	528	1,552	0.071	8
50	297	7,157,220	4,116	3,078	0.141	16
100	149	55,815,000	32,096	6,104	0.280	32
200	74	470,020,000	270,280	12,418	0.570	64
250	61	829,220,000	476,840	15,005	0.689	78
325	44	2,333,200,000	1,341,700	21,184	0.972	110
400	37	3,396,500,000	1,953,100	24,000	1.102	125

* 6 cu. in. is equivalent to 1 lb. of solids at 288 lb./cu. ft. bulk density.

any local jamming, but it appears wiser to supply the wanted void-filling variety of particle sizes by unit grinding prior to agglomeration. (Incidentally, the fresh surfaces created by any particle fracture under packing pressure cannot easily be wetted by plasticizing agents. This fault will be more apparent later as we evaluate the mechanics of plasticizing.)

PLASTICITY, NOT PRESSURE, IS KEY

Instead of a high pressure compelling the particles to agglomerate, it is more nearly correct to consider any agglomeration as a progressive gathering of subassemblies into a larger interlocked structure. Such action is probable only when the loose bulk can suffer some deformation without fracture and when there is both a tendency for and freedom of the individual particles to find their own equilibrium locations during the packing.

This helpful and important phenomenom is called plasticity. It can be artificially promoted in several ways: (1) By adjusting the screen analysis to get some fluosolid mobility; (2) by adding liquids (so-called plasticizers) which make it easier for the fragments to slip into place; (3) by intimate mixing of plasticizers with fines to capitalize on liquid-to-solid surface tensions.

Any liquid medium among fines will lubricate the particle migration and, because the liquid can be displaced, will also afford a higher freedom of movement to the nonyielding solids. Less obvious, but highly significant in the agglomeration process, these liquid plasticizers, when displaced or sheared, give rise to unsatisfied surface tensions which, seeking equilibrium, help the particles reach their optimum locations.

Water is the most commonly used plasticizer, although oil, wax, tar or any material that will submit to moderate shear can be used. Mineral or organic solids that disintegrate as micron suspensions of high surface-tension activity may be added either to stimulate the liquid energy or to reinforce the film strength so it can better lubricate the particle migration. Bentonite, starch, sulfite liquor, dextrin and even waste beer mash are in this category. Wetting agents, although they lessen the helpful surface-tension forces, are useful in that they spread the liquid activity to more points of action.

EFFECTS OF SURFACE TENSION

Fig. 2 illustrates some of these basic surface-tension phenomena. View (a) shows two unattached, thoroughly wetted solid spheres. When these are brought together at (b) the capillary-like valleys between the particles are effectually filled with water, and the contained liquid surface tensions can exert their maximum effect on the particles.

In contrast, View (c) shows two dry particles and two spheres of water. Here the surface tensions are expended in holding the water in droplet form and maintaining an air film adsorbed on the solid. When this poorly wetted cluster is assembled at (d), the adhesion in the capillary valley is apparently rather weak, not only from the satisfied state of the surface-tension forces, but also from the trapped air in the system.

The worth of these capillary forces in the agglomeration process can be demonstrated by squeezing a drop of water between two glass plates. The two plates easily slide in the parallel direction, but the surface tension forces within the liquid capillary film strongly resist any perpendicular separation. If the geometry of the contact planes was not parallel—spherical as in Fig. 2(b)—then you find that the surface-tension forces, seeking equilibrium, not only pull the tangent surfaces together (resist separation) but also try to orient the contact geometry into equal capillary volumes or, in reality, arrange the adjacent planes into the most intimate packing habit.

One could challenge this theory with the argument that once the liquids within the capillaries evaporated, the surface forces would disappear and the agglomerate would disintegrate. Indirectly, the reverse is true, because as liquid evaporates, the capillary films get thinner and the surface-tension forces progressively increase, pulling the particles still closer together. This natural progressive packing is evidenced by the so-called drying shrink.

DON'T OVERLOOK ULTRAFINE SIZES

A shovelful of fines, in some instances, may have a surface area of as much as one acre (see Table I). Further, a given weight of 200-mesh particles has about one-eighth the frequency of contact (number of capillaries) and about one-half the surface area found in a similar weight of the often neglected 400-mesh size.

I was reminded of the importance of these –200-mesh sizes during a study of the relative agglomerating properties of a willing hematite versus a presumed stubborn magnetite ore. At first, the conventional –150 mesh was

the pan size. After some discouraging results the particle sizes were sieved to 400 mesh. This analysis showed that the harder magnetites had most of the −150-mesh fractions staying on the 250 screen, yet the more weathered hematites had at least 40 percent passing 250 mesh. When the fines were adjusted to contain the same number of pieces (similar surface area) below 150 mesh both ores had comparable agglomerating characteristics.

Because this adjustment also equalized the surface-to-mass ratio within each agglomerated piece, the magnetite slugs had an equal or faster reduction rate than the hematite. Significantly, this is contrary to most contemporary published data comparing the reducibility of the two oxides in agglomerated shapes.

GOOD MIXING IS IMPORTANT

Even when particle size analysis is properly adjusted, good agglomeration requires intimate mixing of the various fractions. Hence, the mixing station becomes the pivotal point in any agglomeration flowsheet.

There are several types of mixers that can be used, ranging in action from gentle stirring to intensive attrition milling. The choice depends entirely on the analysis of the starting material and the extent of the natural preparation prior to mixing.

Often a casual examination or average analysis of the raw bulks is deceiving. For example, some filter cake cross-sections showing a 10 percent average moisture content may have a three-fold variation from one surface to the other, and the particle size variety in the cake may exhibit similar stratification. Such a material requires a primary mixing to achieve some degree of uniformity. Stockpiling and indifferent feeding from bins present similar problems.

SEGREGATION MUST BE AVOIDED

Another troublesome characteristic is the high affinity of some fines for liquids. Although this is, in a sense, a positive virtue, it demands a strong blending action to overcome the selective affinity. In fact, this phenomenon is commercially used to separate readily wetted clays from sandy mixtures; with gentle stirring, a seed of wet clay will ignore the sand and gather onto itself only other fine clay particles. It follows that the blending action must be strong enough to discourage this selective wetting inclination; a feeble action will segregate the mixture and defeat its own purpose.

Further, high-speed agitation will often segregate constituents of different specific gravities, so the preferred mixer usually has slow speed combined with strong blending action. As an added advantage, this type of milling action (attrition) has the most positive plasticizing tendency. Attrition milling smears the particles against each other, rubs off adsorbed air films, pushes out the trapped air and discourages any surface-tension forces wanting to gather the liquids into the bead shapes of Fig. 2(d). During any mixing the displaced liquids should fill the capillaries between the particles and gather the particles into subassembled clusters.

MIXING CAN BE OVERDONE

Excessive agitation will flocculate some fines and liquefy certain plasticizer gels, so it is possible to overdo the mixing. However, these cases are quite rare. More often the plasticity depreciates, because extended agitation fractures some particles, exposing fresh surface areas which sponge up the liquids; the batch appears to dry up or stiffen.

As a rule some particle size degradation while mixing is useful. There are several reasons why this is true: First, the micron-size abraded fines of high surface-to-mass ratio increase the surface-tension activity. Second, the degradation knocks off odd corners and projections, making the resulting pieces of more compatible shape.

Third, the freshly fractured surfaces, when made in the mixer, appear to be more easily wetted by the added liquid. I have observed that much better results are obtained when the fines are partially fractured in the mixer, to make the required particle size distribution, than when the fines are fractured entirely outside the mixer to a similar screen analysis and blended without further degradation. Perhaps in dry grinding the newly created solid-surface free energy is stabilized by adsorbed air films which are difficult to dissociate, but when this surface energy is created in the mixer it can immediately seek equilibrium with the plasticizing liquids; hence the wetting action is expedited.

As a rule, with a reasonably normal particle size distribution in the original burden the required plasticity can be achieved by a mechanical attrition action. However, sometimes it is more economical to replace the mechanical method and its kindred abrasion action by using additional plasticizing agents or fines.

Why Use Agglomeration?

TO REDUCE DUSTING LOSSES AND HAZARDS

Carbon black is pelletized to make it cleaner to handle. Fertilizers are granulated to reduce spreading loss. Calcium cyanide is tableted to protect those who handle it.

TO FORM DEFINITE SHAPES AND SIZES

Fixed-bed catalysts, when tableted or pelletized, provide uniform gas-flow resistance. Pressing of metal powders into specific shapes is the first step in powder metallurgy. Tableting of pharmaceuticals simplifies the measurement of doses.

TO RECOVER WASTE MATERIALS

Phosphate ore fines are nodulized so that they can be used in the electric furnace. Lime and coke fines are briquetted for calcium carbide charge. Coal fines are pressed into bricks or cubes and sold as packaged fuel.

TO DENSIFY LIGHT SOLIDS

Carbon black is pelletized to increase its bulk density, save in shipping and storage costs. Plastic preforms make for more accurate and less wasteful loading of molds.

AND MANY MORE

Agglomeration techniques also serve to prevent segregation of solid reactants, to make solids free-flowing, to provide controlled surface-volume ratios and to make structural forms, such as bricks and pipe.

FLOW BRINGS ORDER OUT OF CHAOS

Regardless of the method or machine used for agglomeration, some flow to final seizure must occur, so fluidity of the mix must be watched. With a semifluid or plastic burden, plus some flow to final seizure, you can expect an automatic intermeshing of the particles on a production scale. First, because the burden already has a subassembled nature; second, because the flow while packing will lead any disordered fragments into the ideal arrangements that represent the least resistance to flow. This is like the action of logs floating downstream to the sawmill, aligning themselves into raft-like structures.

A foundry molder inadvertently emphasizes these flow-packing dynamics by shifting as well as ramming his sand mixture into the confined space of a flask. Wisely, he compensates for the short flow path by using a well plasticized or partially assembled accumulation of loose fines. Presses or tableting machines that agglomerate fines in closed cavities with short flow patterns closely emulate foundry batch molding techniques.

Agglomerating machines that use either rams or augers to push plastic masses through dies have an advantage over closed-cavity machines in that the path of flow is much longer. As a result the particles in the agglomerate usually show a greater extent of interlocking.

VACUUM DEAIRING AIDS WETTING

The auger-type machine operates continuously, producing a product of any desired cross-sectional shape. Frequently two augers in tandem accomplish the agglomeration with the aid of vacuum. Such a machine, shown schematically on p. 156, has a mixing section which feeds the loose bulk through a primary sealing die into a vacuum chamber. There the bulk releases the trapped and adsorbed gases, allowing the plasticizers better to wet the solids. The deaired burden is picked up by the screw elements within the vacuum chamber and is extruded through the second die. The material packing in the primary die and extrusion die seals off the vacuum chamber in between.

This so-called deairing stimulates plasticity so that stubborn materials often can be processed with less make-ready milling or plasticizer additions. In most cases, vacuum-extruded agglomerates exhibit higher strengths, both in green and dry states.

The cuts on p. 157 show the effect of vacuum deairing. The topmost view shows a non-deaired slug leaving a die; the center photo shows the same stuff extruded with vacuum. Note that the deaired slugs are self-supporting for more than twice the length of the non-deaired specimens. In the lower cut are seen slugs of an iron ore which was screened through a 1-in. opening and agglomerated by using water alone as the plasticizer.

Many theories have been advanced to explain the effects of vacuum deairing. The most plausible suggests that removal of adsorbed gas films from the solids and removal of dissolved air from the liquids increases the liquid-to-solid surface affinity and thus provides improved strength. This agrees with the surface tension factors analyzed above.

The practice of blending or alloying will often overcome poor packing characteristics. Fines that can neither be used as such nor conveniently agglomerated can be combined with other materials and the blend agglomerated satisfactorily. One company alloys friable coal fines with a lime waste to accomplish the agglomeration. Another combines a waste sludge with screened ore fines.

A somewhat unusual application of the hydraulic flow packing principle is one we might call partial agglomeration. Fluffy, dusty and dry powders of low bulk density, without plasticizers or binders, are put through auger machines. The packing action partially densifies the burden, yet the end product remains pulverulent.

EFFECT OF BINDERS

This discussion would be incomplete without some comment on binders. The term is often misused; almost anything added to an agglomerating bulk is usually called a binder, even though the binding action is not always the result of cementation.

Some agglomerates may double in final strength with only 0.25 percent addition of starch or bentonite. One can hardly imagine that so minute a fraction upgrades the strength while acting merely as a glue. In some instances it is possible that the extra mixing required to incorporate this dash of seasoning inadvertently adds enough incidental attrition to improve the plasticity. As a general rule the so-called binders that are successfully used even in limited quantities owe most of their binding effect to their intrinsic surface forces which exaggerate both the liquid and solid packing tensions, not to any glue-like action holding the surfaces together.

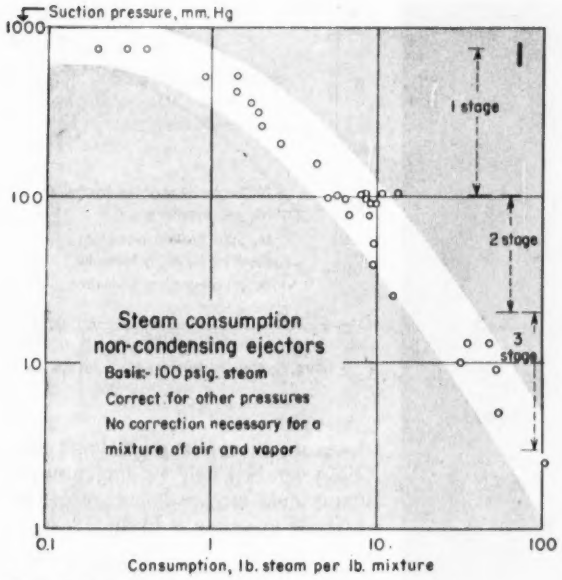
Of course, there are borderline exceptions to this theory. Many agglomeration processes find it economical and necessary to use such things as portland cement, sodium silicate, molasses and coal tar to fortify the strength and weathering characteristics of the slugs by means of a partial chemical bond. Some binders reduce the attrition milling required to induce the basic plasticity, hence compound the value of their addition.

The wisdom of using binders depends on the over-all cost. Too often they are added more as fill, to compensate for a distribution of particle sizes too poor to effect efficient agglomeration. Quite often water alone as the binder-plasticizer (plus proper agglomerating techniques) can suffice to hold fines through calcining, sintering or reduction stages, especially so when the over-all process, including materials handling methods, is designed to suit the burden.

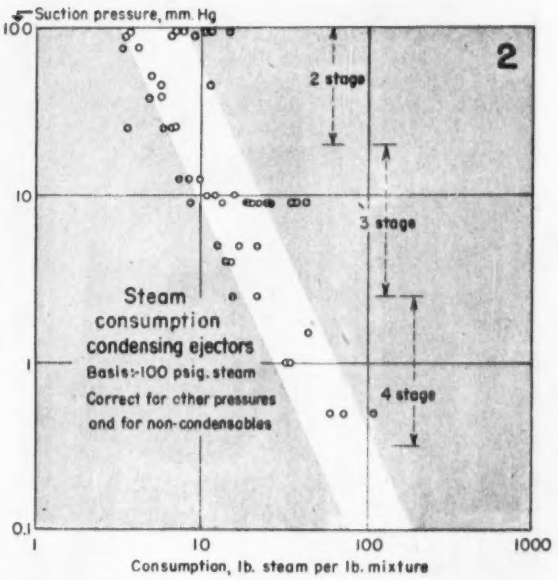
NO TWO PROBLEMS ARE IDENTICAL

The foregoing remarks do not pretend to explain all the mysteries involved in making "big ones from little ones" or offer a panacea that might cure all the ills of agglomeration processes. Every installation or each material has its own peculiar characteristics which are best satisfied in one of several agglomerating or briquetting schemes.

Rather, this article attempts to explain that the packing mechanics, except for scale, are not unlike those in any integrated block structure. We should try to observe some of the laws of hydraulics, lubrication, friction and mechanics that nature has made known to us. Most important, no matter what mechanization we invent to put the fines together, the preliminary material preparation will always be the deciding factor in the flowsheet.



Non-condensing ejectors work best above 100 mm. abs.



Condensing jets are more economical for low pressures.

How to Check Your Jet Utilities

No more guessing about the steam and water requirements of vacuum ejectors. Here are consumption data from eight different sources, tabulated and graphed for your convenience.

P. MESSINA, J. J. BROWN and J. BOHNLOFINK

In recent years, much has been published about steam ejectors and their operation. Usually the emphasis has been placed on mechanical details, orifice coefficients, and process applications. For the engineer interested in how a certain job can be done and what it will require, it is a difficult job to determine steam and water consumption of jet ejectors starting from basic principles. This is a highly empirical business and even advanced chemical engineering thermodynamicists dodge the subject. The usual practice is to rely on some previously determined data, or to request an estimate from a manufacturer.

When a large number of jets are required for setting-up a new process, quotations can be obtained from leading manufacturers and several jets purchased on a guaranteed-performance basis. Performance guarantees may mean over-design to ensure meeting specifications. If you can start with this data, and check other installations under varying test conditions, it is possible to tabulate the results and prepare some curves which permit an order of magnitude estimation of the utility requirements of jets.

Once such a technical data file is established, it can be used in preliminary calculations when ejectors are compared with other vacuum pumping elements. If the decision favors steam ejectors, then it is wise to use the specialized knowledge of various manufacturers for final design and arrangement.

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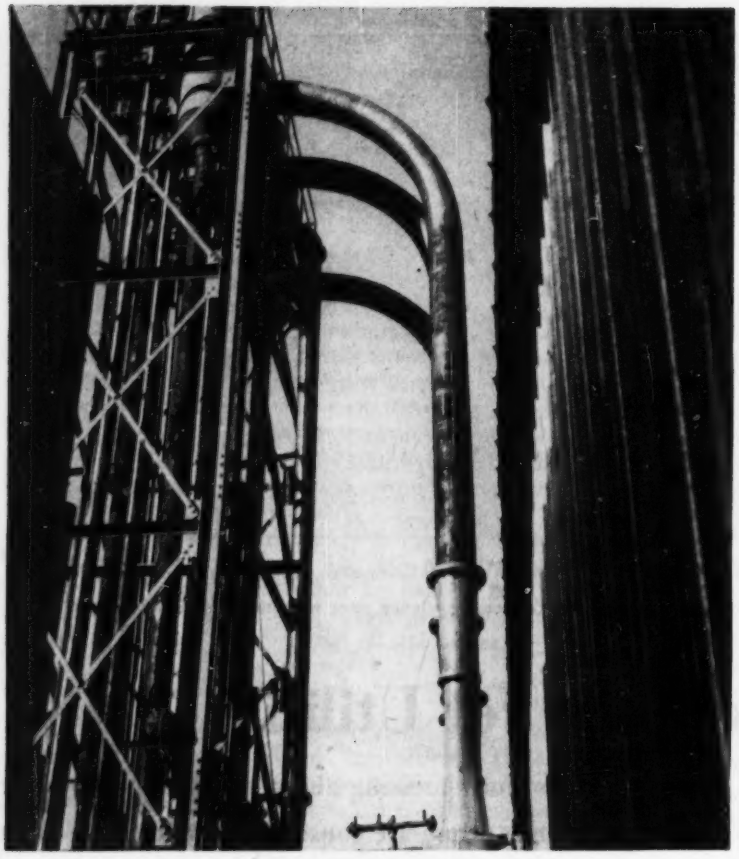
TABULAR LISTING

At the end of this article, 104 sets of consumption data are presented. The type of jet is indicated by checking off the number of stages and the intercondenser arrangements. For uniformity, stage one is always nearest to the process space (lowest absolute pressure). The absolute pressure, which the ejector must maintain, is listed. Ejector capacity at this operating pressure is limited by the amount of air and condensable vapor which must be removed. Motive steam and intercondenser cooling water are consumed in the operation. We can then express this as lb. of steam per lb. of total mixture, and correct with a non-condensables factor and to a standard basis of 100 psig. steam pressure.

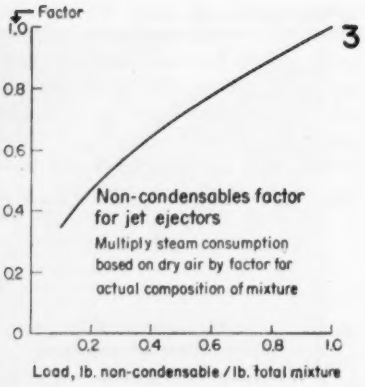
Several manufacturers are represented, and where no other reference is shown, the data are taken from U. S. I. C. technical files.

NON-CONDENSING JETS

Let's consider non-condensing jets first. The trend of consumption (100 psig. steam basis) is shown in Fig. 1. The general pressure limits of one,



Three booster ejectors, 24 in. dia., chill lettuce from 75 to 33 deg. F.



two, and three-stage jets overlap somewhat. Intercondensers are recommended as the pressure decreases, because of the high steam consumption of the three-stage machine; but three-stage non-condensing ejectors have a definite place in the field. They pump down the fastest. Quite often this set-up is used as a hogging jet for pulling down quickly to a low pressure.

Tests for non-condensing jets show that the ratio of non-condensables to total mixture does not profoundly influence the steam consumption. A change from 10 percent to 100 percent dry air calls for only 20 percent more steam. Therefore, a non-condensable correction factor is not applied.

CONDENSING JETS

The steam consumption for condensing jets is also corrected to the standard 100 psig. basis, and in addition a factor is used to correct for the presence of condensable vapor loading. The diversity of possible arrangements when intercondensers are used, accounts for the less accurate curve which can be plotted for condensing jets than for the non-condensing variety. There are insufficient data to allow a classification such as three-stage with one intercondenser, three-stage with two intercondensers, etc. The band, which has been drawn in Fig. 2, is intended to show direction only. It will allow a direct comparison of consumption under different conditions.

STEAM PRESSURE CORRECTION FACTOR

An increase in the available steam pressure decreases the steam requirements of an ejector. The pressure correction factor is plotted in Fig. 3. To convert from 100 psig. to any other pressure, multiply the steam consumption at 100 psig. by the factor read from the curve. To convert from any pressure to 100 psig., divide the consumption at that pressure by the factor.

As a general rule, don't operate jets using steam supplies much lower than 100 psig. Not only are the steam requirements increased, but also instability of operation is likely.

NON-CONDENSABLES CORRECTION

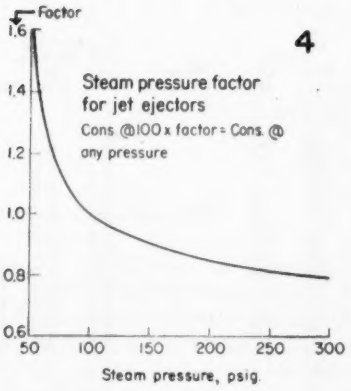
For a condensing jet, the load on subsequent stages depends on the amount of condensable vapor carrying over from prior stages. Therefore, a correlation of steam consumption with load has been shown in Fig. 4. In this case, load is defined as the ratio of non-condensables to total mixture. A load of 1.0 indicates dry air or total non-condensable, and the correction factor for this case is also 1.0. The steam consumption, taken from the chart, should be corrected by multiplying that figure by the factor for actual loading.

For estimating consumption, as outlined in this article, no correction is made for the composition of the condensable vapors. When requesting information from a manufacturer, however, the full composition and properties of the vapors should be included.

WATER

The final plot, Fig. 5, shows water consumption for various jet systems. This graph was prepared by a direct plot of the data with no corrections. Steam and water consumption are related and a family of curves has been drawn. Indicated values do not include aftercondensers, since they are not an actual necessary component of jet ejectors.

Normally, the final stage blows to the atmosphere, or preferably the discharge line should run 6-8 in. below the water level in a hot well. This submergence acts both as a vacuum seal in the event of loss of motive steam



pressure, and a steam condenser with a minimum of back pressure.

If the installation is such that an aftercondenser is required, the quantity of water can be estimated from the simple heat balance:

$$\text{Gpm.} = \frac{W\ (1{,}182 - T_1)}{500\ (T_1 - T_2)}$$

Where: W = lb. of non-condensables entering the condenser per hr., T_1 = temperature of water in tailpipe in deg. F., and T_2 = temperature of inlet water in deg. F.

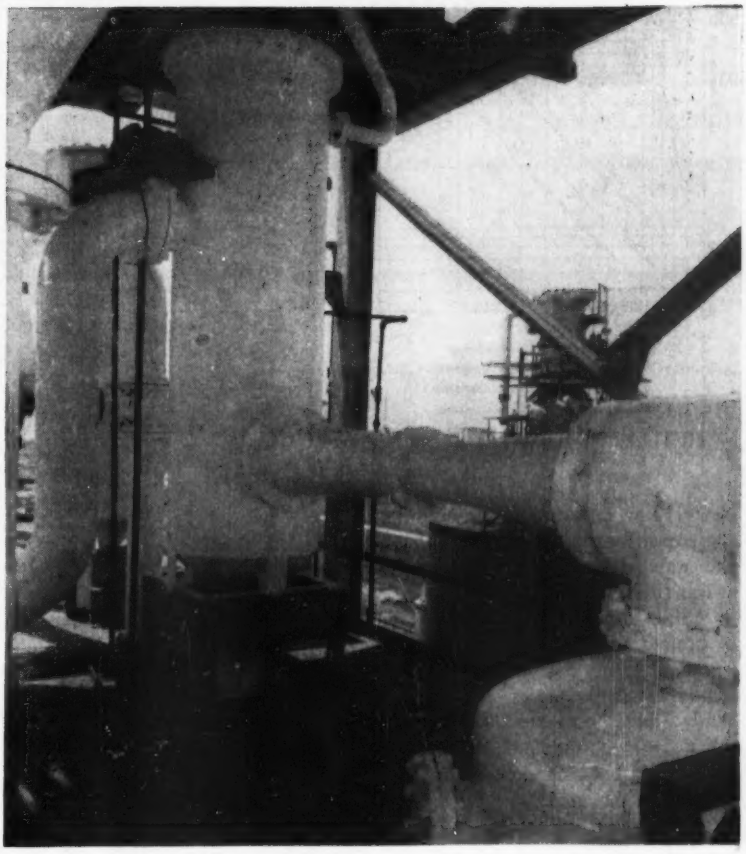
Temperature rises of 20-30 deg. F. for condensing water are normally encountered. Both the equation above and Fig. 5 are based on the use of barometric condensers. Surface intercondensers require more water than indicated, because of the lack of intimate contact and poorer heat transfer. They are particularly useful where height is limited or the condensable vapors must be recovered undiluted.

In considering water requirements for ejectors, check the inlet water temperature to be sure that condensation of vapors can occur. If the vapor pressure of the condensable vapors is low, chilled water might be needed to effect condensation. As an example, let's say that condensing water is available at 90 deg. F., and a 20 deg. temperature rise is allowable, giving 110 deg. F. as the outlet water temperature. The allowable terminal difference is taken from the "Standards of the Heat Exchange Institute for Barometric and Low Level Jet Condensers," as 5 deg. F.

The terminal difference is the difference between the vapor temperature at its partial pressure and the outlet water temperature. This would mean an equivalent saturation temperature of 115 deg. F., corresponding to a partial pressure of water at 3.0 in. Hg.

Normally, 90 deg. F. water would not be used after any stage with an absolute pressure less than 3.0 in. Hg, the higher the temperature of the condensing water, the higher the pressure should be. This indicates that condensers are of most utility after the second or third stage in a multistage unit.

Most manufacturers will recommend a minimum water consumption figure for jets requiring small quantities of steam. In any case, for purposes of estimating a minimum water consumption, 5 gpm. after condensing jets is adivsable.



Milk of lime is flash-cooled by 16 in. ejector and a barometric condenser.

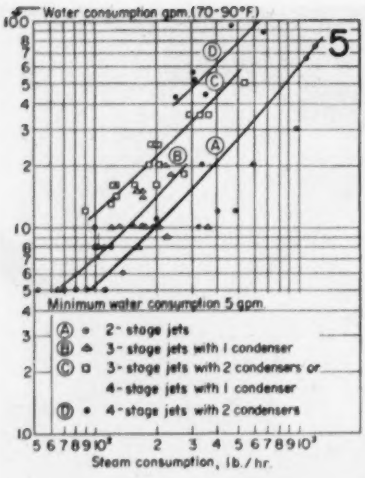
SAMPLE CALCULATION

To pin down the technique involved in using the five graphs, we'll run through a typical example. Let's assume that a three-stage ejector is available which has one intercondenser. Our process must run at an absolute pressure of 6 mm. Hg, and the load consists of 10 lb. of air, 5 lb. of steam plus 12 lb. per hr. of alcohol vapor. Motive dry steam can be supplied at 125 psig., and the plant cooling water supply might be as hot as 80 deg. F. during the summer months.

The total load on the ejector is 27 lb. of mixture per hr., and steam consumption can be read from Fig. 2 (condensing jets) as 17.5 lb. of steam per lb. of total mixture, or 27 × 17.5 = 472 lb./hr. of motive steam at 100 psig. Since our supply is 125 psig., we can correct this consumption estimate with a steam pressure correction factor taken from Fig. 4.

We'll have to correct for the noncondensable loading also. Using Fig. 3, the load is 10/27 = 0.37. The corresponding factor is 0.62. Therefore, the steam consumption at 125 psig. amounts to 472 × 0.94 × 0.62 = 275 lb./hr.

Water consumption can be estimated from Fig. 5, if we use the curve which has been drawn for three-stage


Water consumption gpm (70-90°F)
Minimum water consumption 5 gpm
(A) ○ 2-stage jets
(B) △ 3-stage jets with 1 condenser
(C) □ 3-stage jets with 2 condensers or 4-stage jets with 1 condenser
(D) • 4-stage jets with 2 condensers
Steam consumption, lb./hr.

ejectors with one intercondenser. Since the steam consumption is 275 lb./hr., the water requirements will be between 19-20 gpm.

While these calculations might be of limited accuracy, they give the designer and the operating engineer a handy way to tackle the problem. Certainly these estimates indicate an order of magnitude and establish a scale against which competitive machines can be rated.

SOME GENERALIZATIONS

Some general effects can be noted if we peruse the data. Non-condensing jets aren't steam hogs as long as the absolute pressure is above 100 mm.; below this pressure the steam consumption increases rapidly. For these conditions, intercondensers are used to cut down the steam consumption at the expense of cooling water. The location of intercondensers can be tricky. Look at entries 59 and 60 in the table. Here a three-stage ejector will require twice the steam, to do the same job, if we switch the location of the intercondenser from between stages 2 and 3 to a position between stages 3 and 4.

REFERENCES

1. Anon., *Chemical Engineering*, 56, 136 (May 1949).
2. "Cameron Hydraulic Data," 11th. Ed., Ingersoll-Rand Co., New York, (1942).
3. Croll-Reynolds Co., Evactor Catalogs, New York.
4. Elliott Company, Bulletin G-14, Jeanette, Pa.
5. Heat Exchange Institute Standards, "Barometric and Low Level Jet Condensers," New York, (1951).
6. Stinson, L. S., *Powerfax*, 27, 16 (Summer 1949).
7. Worthington Corp., Catalog W-205-S1A, Harrison, N. J.
8. Worthington Corp., Catalog W-205-S11B, Harrison, N. J.
9. Zimmerman, O. T., and I. Lavine, "Chemical Engineering Costs," 1st. Ed., Industrial Research Service, Dover, N. H., (1950).

Ejector Steam and Water Requirements

No.	Type of Jet 1	2	3	4	Abs. Press., Mm. Hg	Capacity Air, Lb./Hr.	Capacity Vapor, Lb./Hr.	Steam Psig.	Steam Lb./Hr.	Water °F	Water Gpm.	Lb. Steam per Lb. Mixture As Read	Lb. Steam per Lb. Mixture As Corr.	Ref.*
Non-Condensing														
1.	X				89	15.0	0	100	137			9.1	9.1	
2.	X				89	15.0	11.5	100	260			9.8	9.8	
3.	X				95	10.0	10.0	110	100			5.0	5.1	
4.	X				95	5.0	20.0	110	210			8.4	8.6	
5.	X				95	5.0	20.0	110	157			6.3	6.4	
6.	X				100	40.0	0	100	575			5.8	5.8	
7.	X				102	10.0	0	100	80			8.0	8.0	
8.	X				102	10.0	0	100	132			13.2	13.2	
9.	X				102	15.0	0	100	161			10.7	10.7	
10.	X				102	10.0	5.8	100	135			13.0	13.0	
11.	X				102	100	0	100	575			5.8	5.8	
12.	X				102	—	—	100	—			7.5	7.5	4
13.	X				127	—	—	100	—			5.4	5.4	4
14.	X				152	100	0	100	425			4.3	4.3	1
15.	X				200	300	0	100	775			2.6	2.6	7
16.	X				203	100	0	100	245			2.5	2.5	1
17.	X				254	100	0	100	200			2.0	2.0	1
18.	X				305	—	—	100	—			1.9	1.9	4
19.	X				356	—	—	100	—			1.7	1.7	4
20.	X				407	—	—	100	—			1.4	1.4	4
21.	X				500	449	0	—	420			0.9	0.9	6
22.	X				508	100	0	—	140			1.4	1.4	9
23.	X				735	640	0	100	282			0.4	0.4	
24.	X				735	675	0	100	228			0.3	0.3	
25.	X				735	680	0	100	146			0.2	0.2	
26.	X	X			9	5	10	110	800			53.4	54.8	
27.	X	X			13	100	0	—	2600			26.0	26.0	9
28.	X	X			13	100	0	100	3850			38.5	38.5	1
29.	X	X			25	100	0	100	1250			12.5	12.5	1
30.	X	X			38	100	0	100	950			9.5	9.5	1
31.	X	X			51	100	0	100	950			9.5	9.5	1
32.	X	X			76	100	0	100	675			6.8	6.8	1
33.	X	X			76	100	0	—	900			9.0	9.0	9
34.	X	X	X		2.5	10	0	100	1056			105.6	105.6	1
35.	X	X	X		5.0	10	0	100	556			55.6	55.6	1
36.	X	X	X		10.0	10	0	100	322			32.2	32.2	1
Condensing														
1.	X	X	X		9	5	0	110	111	90	5	22.2	22.8	
2.	X	X	X		10	100	0	100	1100	—	65.7	11.0	11.0	8
3.	X	X	X		12.7	10	0	100	99	—	—	9.9	9.9	2
4.	X	X	X		12.7	100	0	—	850	—	—	8.5	8.5	9
5.	X	X	X		13	100	0	100	980	70	30	9.8	9.8	1
6.	X	X	X		25	50	0	100	337	—	20	6.7	6.7	8
7.	X	X	X		25	100	0	100	600	70	20	6.0	6.0	1
8.	X	X	X		25.4	10	0	100	70	—	—	7.0	7.0	2
9.	X	X	X		25.4	165	15	100	1210	85	75	6.7	7.0	
10.	X	X	X		38	100	0	100	490	70	12	4.9	4.9	1
11.	X	X	X		38.1	10	0	100	58	—	—	5.8	5.8	2
12.	X	X	X		45	10	20	110	99	90	8	3.3	5.7	
13.	X	X	X		45	10	20	110	200	90	11	6.7	11.4	
14.	X	X	X		50.8	10	0	100	50	—	—	5.0	5.0	2
15.	X	X	X		51	100	0	100	400	70	12	4.9	4.9	1
16.	X	X	X		76	100	0	100	325	70	10	3.3	3.3	1
17.	X	X	X		76.2	10	0	100	42	—	—	4.2	4.2	2
18.	X	X	X		89	15	0	100	99	80	10	6.6	6.6	
19.	X	X	X		89	15	0	100	137	80	6	9.1	9.1	
20.	X	X	X		89	15	11.5	100	70	80	5	2.7	3.5	
21.	X	X	X		89	30	0	100	192	80	10	6.4	6.4	
22.	X	X	X		95	10	10	110	52	90	5	2.6	3.7	
23.	X	X	X		95	10	10	110	110	90	8	5.5	7.9	
24.	X	X	X		95	5	20	110	80	90	5	3.2	7.0	
25.	X	X	X		95	5	20	110	104	90	8	5.2	11.4	
26.	X	X	X		95	5	20	110	120	90	8	4.8	10.4	
27.	X	X	X		95	5	20	110	170	90	10	6.8	14.9	
28.	X	X	X		101.6	10	0	100	38	—	—	3.8	3.8	2
29.	X		X	X	2.5	10	0	100	222	70	20	22.2	22.2	1
30.	X		X	X	5.0	10	0	100	172	70	14	17.2	17.2	1
31.	X		X	X	9	5	0	110	65	90	5	13.0	13.4	
32.	X		X	X	9	5	0	115	120	90	10	24.0	25.0	
33.	X		X	X	9	5	0	110	153	90	10	11.3	19.5	
34.	X		X	X	9	5	0	110	173	70	10	34.6	35.5	
35.	X		X	X	9	5	0	110	205	90	10	41.0	42.1	
36.	X		X	X	9	5	10	115	160	90	15	10.7	18.6	
37.	X		X	X	9	5	10	115	171	90	15	11.4	20.0	
38.	X		X	X	9	5	10	110	236	90	18	15.7	27.0	
39.	X		X	X	10	10	0	100	122	70	8	12.2	12.2	1
40.	X		X	X	12.7	10	0	100	73	—	—	7.3	7.3	2
41.	X		X	X	25.4	10	0	100	59	—	—	5.9	5.9	2
42.	X	X	X		2.5	10	0	100	360	70	10	36.0	36.0	1
43.	X	X	X		5.0	10	0	100	222	70	9	22.2	22.2	1
44.	X	X	X		10.0	10	0	100	161	70	8	16.1	16.1	1
45.	X	X	X	X	2.5	10	0	100	156	70	16	15.6	15.6	1
46.	X	X	X	X	5.0	10	0	100	128	70	14	12.8	12.8	1
47.	X	X	X	X	5.0	10	0	—	200	—	16	20.0	20.0	6
48.	X	X	X	X	9	5	0	110	100	90	—	20.0	20.6	
49.	X	X	X	X	9	5	0	125	123	90	161	24.6	26.2	
50.	X	X	X	X	9	5	0	110	185	90	20	37.0	38.0	
51.	X	X	X	X	9	5	10	125	196	90	25	13.?	23.4	
52.	X	X	X	X	9	5	10	110	202	90	25	13.5	23.5	
53.	X	X	X	X	9	5	10	110	330	90	35	22.0	38.0	
54.	X	X	X	X	9	5	10	110	360	90	35	24.0	41.4	
55.	X	X	X	X	9	10	10	110	120	90	13	6.0	8.6	
56.	X	X	X	X	9	10	10	110	191	90	25	9.6	13.6	
57.	X	X	X	X	10	10	0	100	128	70	14	12.8	12.8	1
58.	X	X	X	X	10.0	25	0	—	275	—	18	11.0	11.0	6
59.	X		X	X	0.5	5	0	110	290	90	35	58.0	59.5	
60.	X		X	X	0.5	5	0	110	540	90	50	108	111	
61.	X		X	X	0.5	5	0	110	310	90	52	62	63.6	
62.	X		X	X	0.5	5	0	110	250	90	43	50	51.4	
63.	X		X	X	1.0	10	0	100	350	85	44	35.0	35.0	
64.	X		X	X	1.0	20	0	100	675	85	48	33.7	33.7	
65.	X		X	X	1.5	3	10	100	306	—	56	23.6	44.5	
66.	X		X	X	4.0	30	0	100	470	85	95	15.7	15.7	
67.	X		X	X	4.0	35	0	100	525	—	—	15.0	15.0	
68.	X		X	X	4.0	70	0	100	995	—	—	14.2	14.2	

* Where no other reference is shown, data are taken from U.S.I.C. technical files.

Simplify Batch Distillation Calculations

For use in preliminary design calculations, this shortcut uses a new application of an old and classic method. Results are shown to approximate those from more tedious solutions.

CHAO KWANG-CHU

BATCH distillation of multicomponent mixtures often causes very difficult design problems because of ever-changing compositions as distillation progresses. And if you take into account the effect of column holdup, you are faced with an imposing system of differential equations. Use of finite difference equations is simpler, but still prohibitively tedious in most cases.[1]

Neglecting the effect of holdup, Robinson and Gilliland[2] have used a modified form of the relative operability factor method to speed up calculations. But even this leaves a trial and error solution.

The suggested shortcut is essentially a modification of Brown and Souders' absorption factor method, originally applied to continuous distillation. It neglects holdup and assumes constant values for K, which is equivalent to assuming that there are no temperature or pressure gradients in this tower. Obviously this is thermodynamically unsound and hence, the direct solution doesn't add up to unity.

This method does, however, yield a simple approximation for use in preliminary design. When applied with discretion under conditions of large reflux ratio and few theoretical plates, the results are quite close to those obtained by the longer Robinson-Gilliland method.

DERIVATION OF SHORTCUT

A material balance around any plate, using $S=KV/O$, yields:

$$x_n = (S^{n-1}+S^{n-2}+\ldots S+1)x_1 - S(S^{n-2}+S^{n-3}+\ldots S+1)y_L/K \quad (1)$$

An over-all material balance for the tower, including the condenser and reflux separator, but excluding the reboiler, yields: $D + O = V$. For any component, $Dx_D + Ox_1 = Vy_L$. Combining these,

$$x_1 = Vy_L/O - x_D(V/O - 1) \quad (2)$$

Assuming a total condenser is used,

$$x_D = y_n = Kx_n \quad (3)$$

Substituting Eq. (1) into Eq. (3),

$$x_D = [K(S^n - 1)x_1 - S(S^{n-1} - 1)y_L]/(S - 1) \quad (4)$$

Combining Eqs. (2) and (4), and substituting $y_L = Kx_L$,

$$x_D = \left[\frac{KS^n(S-1)}{S^n(S-K)+K-1}\right]x_L \quad (5)$$

Under constant reflux conditions, the bracketed factor is a constant, but has different values for each component. Designating this factor as k, Eq. (5) simplifiies to:

$$x_D = kx_L \quad (6)$$

Eqs. (5) and (6) show a direct relationship between the composition of the liquid in the still and the composition of an instantaneous amount of product. Therefore, by differential material balance and integration using Eq. (6),

$$x_L = (x_L)_o(L/L_o)^{k-1} \quad (7)$$

From Eq. (7), the composition of liquid left in the still after distilling off any known portion of the original charge can be calculated. The average distillate composition can then be obtained by material balance.

SAMPLE PROBLEM

Consider the fractionation of an equimolal mixture of A, B, C and E at a reflux ratio of 5.0. Relative volatilities are $\alpha_{AB} = 2.0$, $\alpha_{AC} = 4.0$ and $\alpha_{AE} = 8.0$. The column is equivalent to three theoretical plates and will be operated with a total condenser. Neglect liquid holdup and assume constant values for K. What is the initial vapor overhead composition and what is the composition of the liquid in the still after distilling off 22.3 percent of the charge?

NOMENCLATURE

α_{12}	Relative volatility, K_1/K_2
D	Distillate, moles
k	Bracketed factor in Eq. (5)
K	Vaporization equilibrium ratio
L	Liquid in still, moles
n	Number of theoretical plates
O	Reflux, moles
S	Absorption factor, KV/O
V	Rising vapor, moles
x	Mole fraction in liquid
y	Mole fraction in vapor

SUBSCRIPTS

o	Original value
$1, 2, \ldots n$	Plate of origin or component
A, B, C, E	Component
D	Product
L	Liquid in still

From the relative volatilities,

$K_A = 2.13$ $\quad K_C = 0.533$

$K_B = 1.066$ $\quad K_E = 0.2665$

From Eqs. (5) and (6),

$k_A = 6.74$ $\quad k_C = 0.1148$

$k_B = 1.221$ $\quad k_E = 0.00811$

The initial vapor composition, calculated from Eq. (6), is shown below. Although these values don't total unity, they can be made to do so by proportioning and the results are then quite close to those obtained by the Robinson-Gilliland method.

	Eq. (6)	Proportioned	Robinson-Gilliland
x_A	1.6820	0.833	0.8510
x_B	0.3055	0.151	0.1380
x_C	0.0287	0.014	0.0110
x_E	0.0022	0.001	0.0006

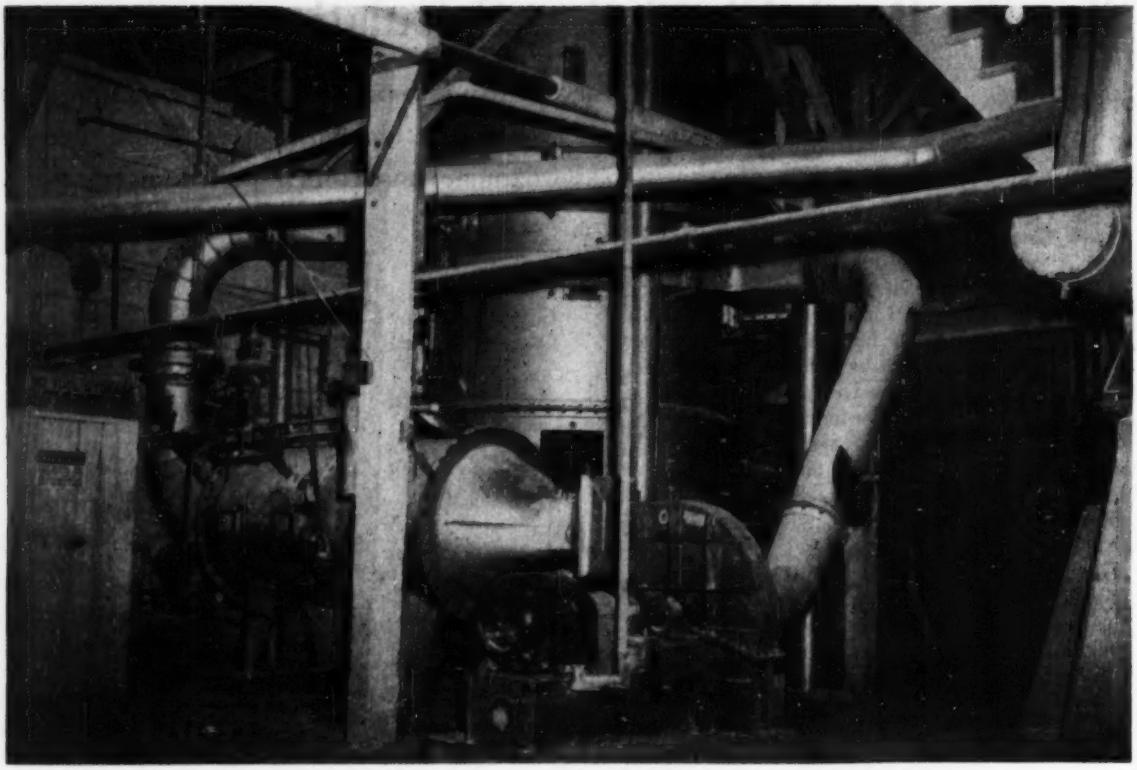
The composition of liquid left after removing 22.3 percent of the charge is calculated from Eq. (7)..

	Eq. (7)	Proportioned	Robinson-Gilliland
x_A	0.033	0.036	0.098
x_B	0.236	0.259	0.257
x_C	0.316	0.347	0.320
x_E	0.325	0.357	0.325

REFERENCES

1. Rose and Johnson, *Chem. Eng. Prog.*, 49, 15 (1953).
2. Robinson and Gilliland, "Elements of Fractional Distillation," McGraw-Hill Book Co., N. Y. (1950).
3. Brown and Souders, *Trans. A. I. Ch. E.*, 30, 438 (1933).

CHAO KWANG-CHU *is a chemical engineer with Taiwan Alkali Co., Taiwan, China. He received his B.S. in Ch. E. from the Univ. of Chekiang in 1948, his M.S. in Ch. E. from the Univ. of Wisconsin in 1952.*



GAS FIRED horizontal furnace raises preheated air temperature for fluidizing and drying salt in vertical dryer.

Fluidized Crystal Dryer Pays Off

It slashes fuel cost two thirds, dries at lower temperature, reduces crystal degradation, eliminates separate cooler and uses less floor space. Control is completely automatic.

CHARLES W. JOBES

Adaptation of fluidization to crystal drying has registered some clear-cut gains for The Carey Salt Co. At the Hutchinson, Kansas plant a recently installed fluidized salt dryer is doing the same job as kiln dryers—but doing it with one third the fuel consumption.

WHAT'S BEHIND PERFORMANCE?

Two factors are largely responsible for the big jump in efficiency. By utilizing fluidization, intimate contact is obtained between hot drying air and the moist salt crystals. At the same time use of a second fluidized bed serves to cool the hot dried salt and preheat entering cool atmospheric air.

Aside from the primary advantage of boosted efficiency there are some secondary advantages arising from use of this type of dryer. Temperatures in the drying bed are less than half those found in the kiln dryers. With lower temperatures there is somewhat less crystal degradation. Product crystals have a more lustrous appearance.

By combining the dryer and cooler in one unit, floor space requirements have been reduced two thirds. And the entire operation can be controlled automatically.

Product being dried is a high purity, vacuum pan, table salt, with crystal sizes essentially all minus 30 plus 100 mesh. The dryer is designed to dry 5 tph. of salt from 3 to 0.03 percent final moisture.

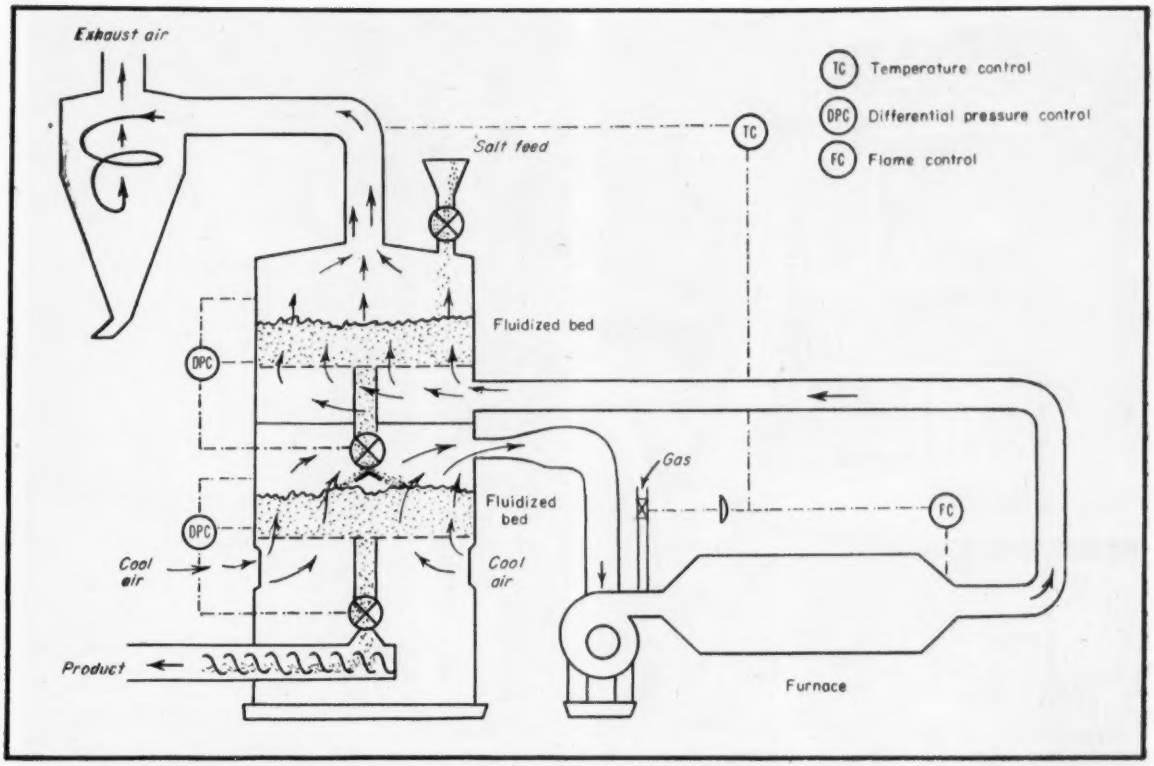
Drying is done by air which is first preheated by passing through the cooling bed, then heated in a gas fired furnace before being introduced to the drying bed.

Dryer is a vertical, cylindrical unit with the fluidized beds stacked one over the other. Moist salt enters at the top, is dried on the top bed. Then it passes down to the lower or cooling bed before being dumped into a screw conveyor which carries it away.

IT'S BUILT IN SECTIONS

Measuring 8 ft. in diameter the dryer stands 16 ft. 8 in. high. Three flanged cylindrical welded steel sec-

CHARLES JOBES *is a process engineer with The Carey Salt Co., Hutchinson, Kansas. Mr. Jobes was in charge of the fluidized dryer project from pilot plant through to final development.*



SALT flows down through drying and cooling stages; air passes through cooling bed, furnace and drying bed to vent.

tions of ¼ in. plate make up the dryer body. Two ¼ in. aluminum plates serve as fluidizer bed plates.

Small holes on ½ in. centers serve as openings for air flow through the plate. In the center of each plate is an 8-in. down take pipe containing a rotary air-lock feeder. Variable speed d.c. motors are direct connected to the feeders for withdrawing salt at a controlled rate.

The top or drying section of the unit is 4 ft. high with a 5-in. dome. A 16-in. duct, attached to the domed top, discharges the hot moist air into a cyclone dust collector. Rubber lined, welded steel construction was used in the collector.

Wet salt is fed into the dryer through rotary feeders on the domed top. These are located near the outer edge and opposite each other.

A ¼-in. steel plate welded to the dryer shell divides the 6-ft. middle section into two chambers—the plenum chamber beneath the drying bed and the cooling chamber containing the cooling bed.

The bottom section of the dryer contains the entry ports for the atmospheric air. In this section, too, is located the feeder withdrawing salt from the cooling bed for discharge into the take-away conveyor.

Furnace supplying hot air to the dryer is a horizontal welded steel cylinder 8 ft. long and 3 ft. in diameter. It is covered with 3 in. of insulation.

A centrifugal blower ahead of the furnace draws room air up through the fluidized cooling bed and blows it into the furnace. Hot air from the furnace passes into the plenum chamber below the fluidized drying bed.

DRYING THE PRODUCT

Typical conditions during operation of the fluidized dryer are shown by reproduction of an operating log. Wet salt from the filter belt is fed into the two rotary feeders atop the dryer by variable speed screw conveyors. These feeders then deliver the salt to the drying bed. At the same time they serve as air locks.

On initial startup the fluidized state of the drying bed must be achieved with hot dry salt before wet salt is introduced. Hot air from the furnace rising through the fluidizer bed plate heats the wet salt to 235 deg. F.

Dried salt is withdrawn continuously through the downtake which extends through the plenum chamber into the cooling chamber. The rotary air-lock feeder in the downtake dumps the salt onto an inverted V-shaped baffle which distributes the hot salt over the fluidized cooling bed.

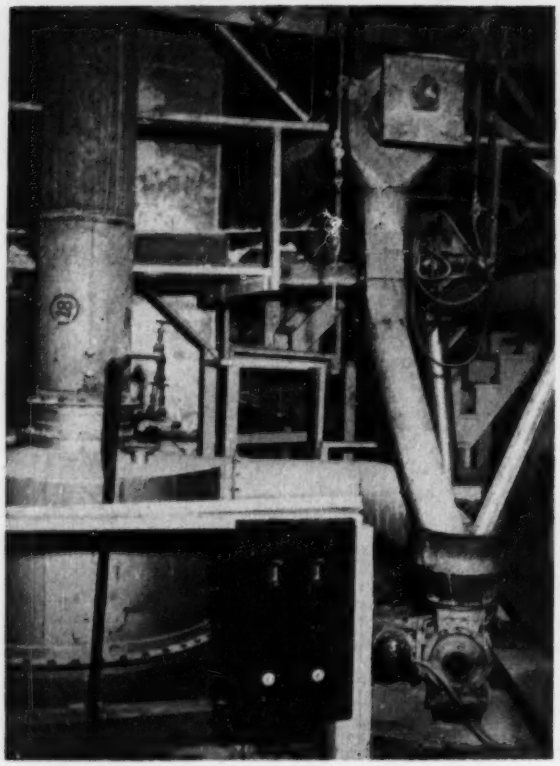
Cool room air drawn upward through the bed is preheated by the hot salt; the hot salt is cooled by the air. Cooled salt is withdrawn through rotary feeder into screw conveyor.

INSTRUMENT CONTROL

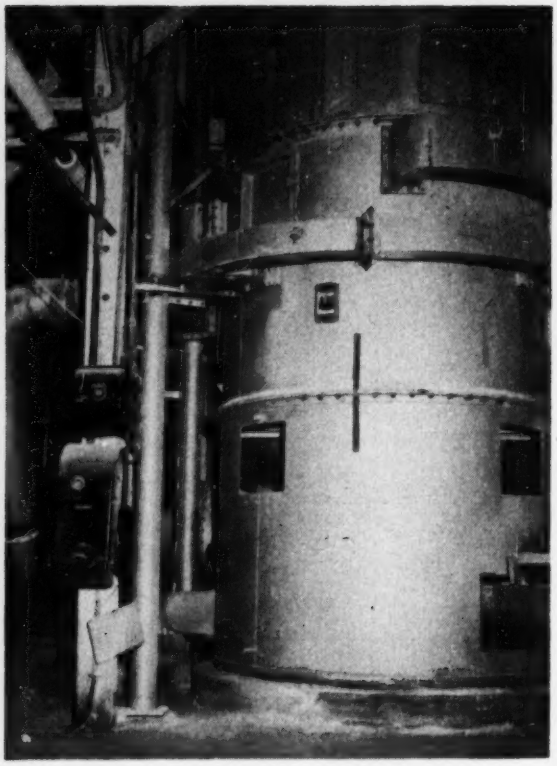
A drying system of this type obviously requires automatic controls, both on heat input and rate of salt flow through the unit. Bed depths must be maintained accurately to assure proper fluidization. For high efficiency operation the rate of gas firing must be closely controlled.

Bed depths are controlled by using the differential pressures of air flowing through the beds to regulate speed of the rotary feeders in the downtakes. These differential pressures, varying from 0 to 18 in. of water, are converted to controlled air pressures in the range of 3 to 15 psi.

A pneumatic controller in the con-



WET salt slides into feeder; air exhausts through cyclone.



DRY salt leaves by screw conveyor; cool air enters ports.

trolled-air system has set point indices adjusted to the desired bed depth. Movement of the indicating pens with respect to the set point indices modulates controlled air pressures which act through cylinders to position resistors in the electronic controls for the feeder drives. The resistors regulate output voltage of the controls to determine speed of the ¾ hp. d.c. motors driving the rotary feeders.

A draft gage on the control board indicates pressures under and over both fluidized beds.

Heat demand may vary with feed rate and moisture content of the feed. Control of this variable is provided by measurement of the exit air temperature.

A thermocouple mounted in the duct leading to the dust collector measures exit air temperature. Thermocouple is connected to a potentiometer recorder-controller with pneumatic output to a diaphragm motor valve in the main gas supply line to the furnace burner.

Burner is designed to release 1,200,000 Btu. per hr. from 1,000 Btu. per cu. ft. natural gas at 20 psig. Flame control on burners provides safe operation.

A four point indicating and recording strip chart potentiometer on the control board indicates and records temperature of preheated air to fan; temperature of air to drying bed; temperature of salt in the drying bed at a point 6 in. above the bed plate and under one of the feeders; and temperature of the exit air.

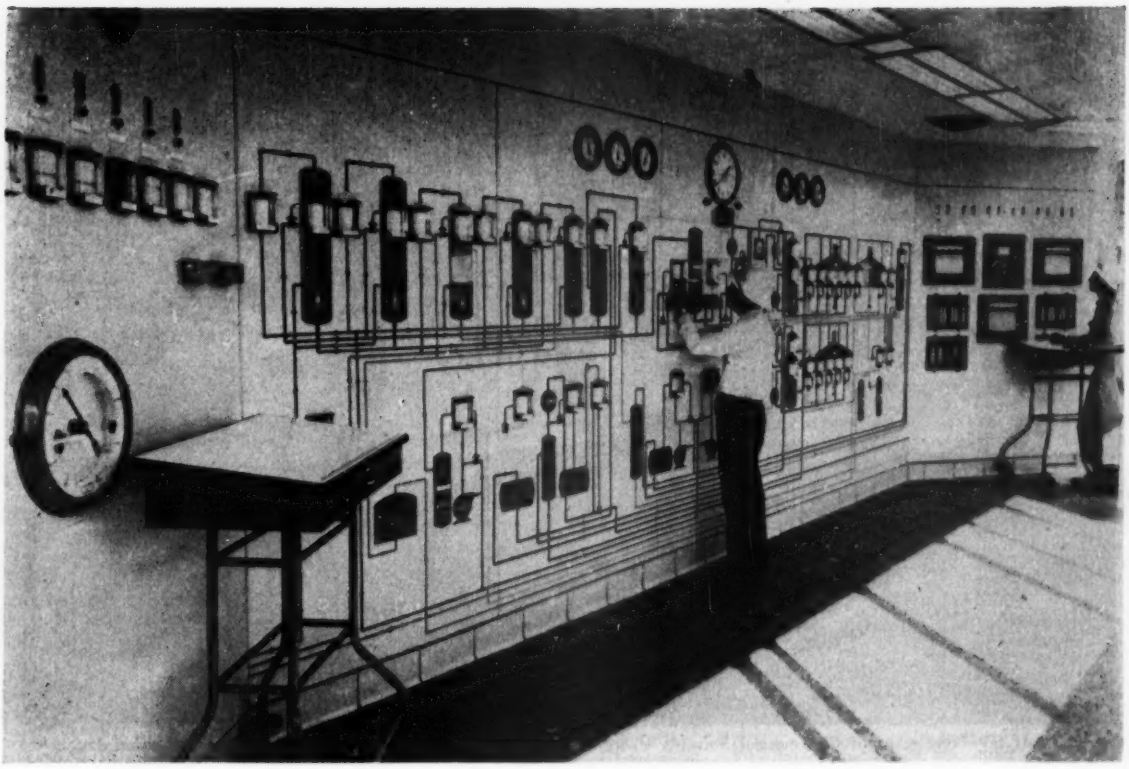
Basic research and development for this drying method was conducted at Midwest Research Institute, Kansas City. The system was designed and constructed by Combustion Engineering, Inc., Flash Dryer Div., Chicago.

Operating Log, Salt Dryer

DATE 9/9/53 TIME 2 PM

FEED	
Rate	5.0 tph.
Moisture content	2.8 %
Temperature	100 °F
PRODUCT	
Moisture content	0.027 %
Temperature	153 °F
AIR	
Volume (@ 62°F, 1 atm.)	2,500 cfm.
Temperature	
Inlet	80 °F
To fan	149 °F
To drying bed	392 °F
Exit	235 °F
Pressure	
Above cooling bed	−12.0 in. H_2O
Under drying bed	+23.0 in. H_2O
Above drying bed	+ 3.0 in. H_2O
GAS CONSUMPTION	
Rate (@ 1,000 Btu. per cu. ft.)	10 cfm.
Per ton of salt	120 cu. ft.

TYPICAL CONDITIONS during operation of the dryer.



PLANTS & PROCESSES

The year 1953 capped a record for new plant construction in the chemical process industries; it also chalked up an impressive list of new developments in processes and technology. Here, summarized for your easy reference, is our fourth annual inventory of new plants and technology advances: 675 new construction projects and over 325 process and technology developments.

CHEMICAL ENGINEERING REPORT—JANUARY 1954

LAST year the entire chemical process industries spent close to $6.5 billion for new plants, facilities and expansions. That's double the figure for 1950, only three years ago.

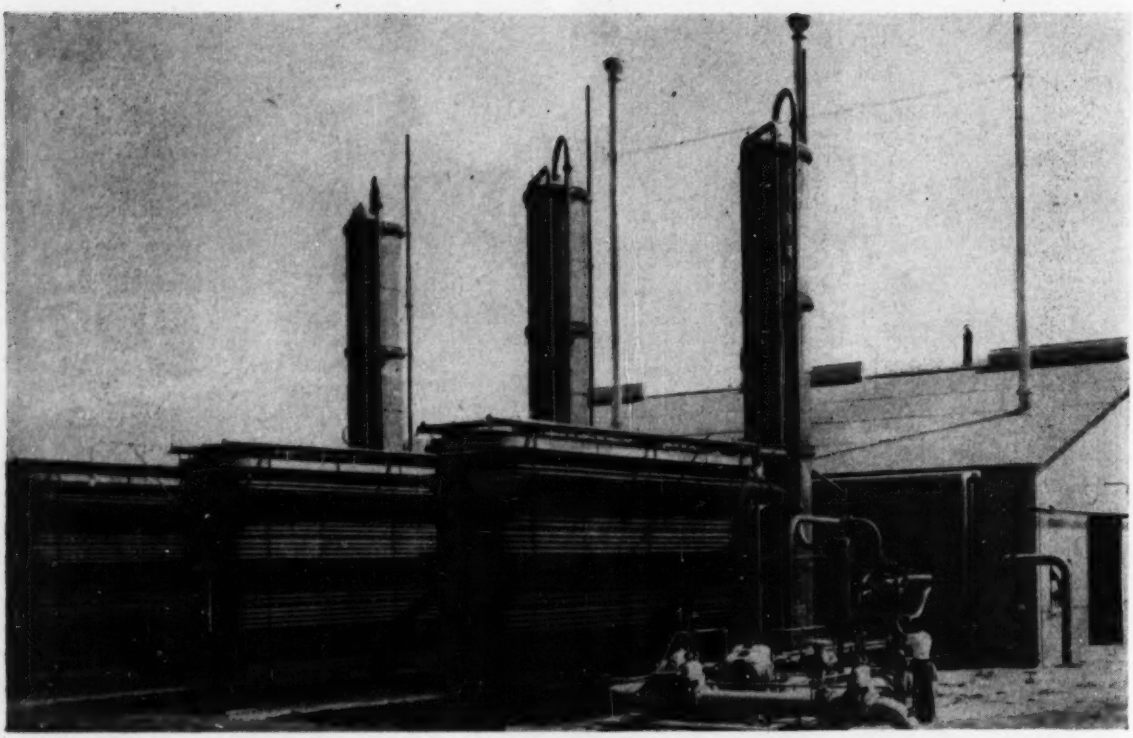
For 1953 the chemical industry alone spent $1.8 billion for facilities to turn out chemical and allied products, a 135 percent increase over 1950. And for this year the figure for chemicals will hit close to $1.6 billion.

All this means more plants, bigger plants, better plants. Our tally for 1953, for example, shows over 675 plant projects.

Listings in this issue include those new plants and facilities that were planned, under construction or completed during the period from November 1952 through October 1953. We stress that some projects listed as "planned" may never materialize. This is especially true of those carrying certificates of necessity.

This year, for the fourth time, we bring you our annual inventory of major technological developments. This report, covering advances announced or commercialized during the two-year period 1952-1953, lists some 340 specific achievements. Last year's figure came to 292 as compared with about 200 for the previous year.

In this issue's report, as in all previous ones, we have aimed for complete and accurate coverage. All listings have been digested, categorized and tabulated in a way especially designed for quick and easy reference.



NITRIC ACID—New plant of Commercial Solvents Corp., Sterlington, La. Three 60-ton-per day units of improved design.

New Plants and Facilities Under Way 1953

Below is a partial listing of U. S. plants and facilities—in or related to the chemical process industries—either planned, under construction, or completed during 1953.

AGRICULTURAL CHEMICALS

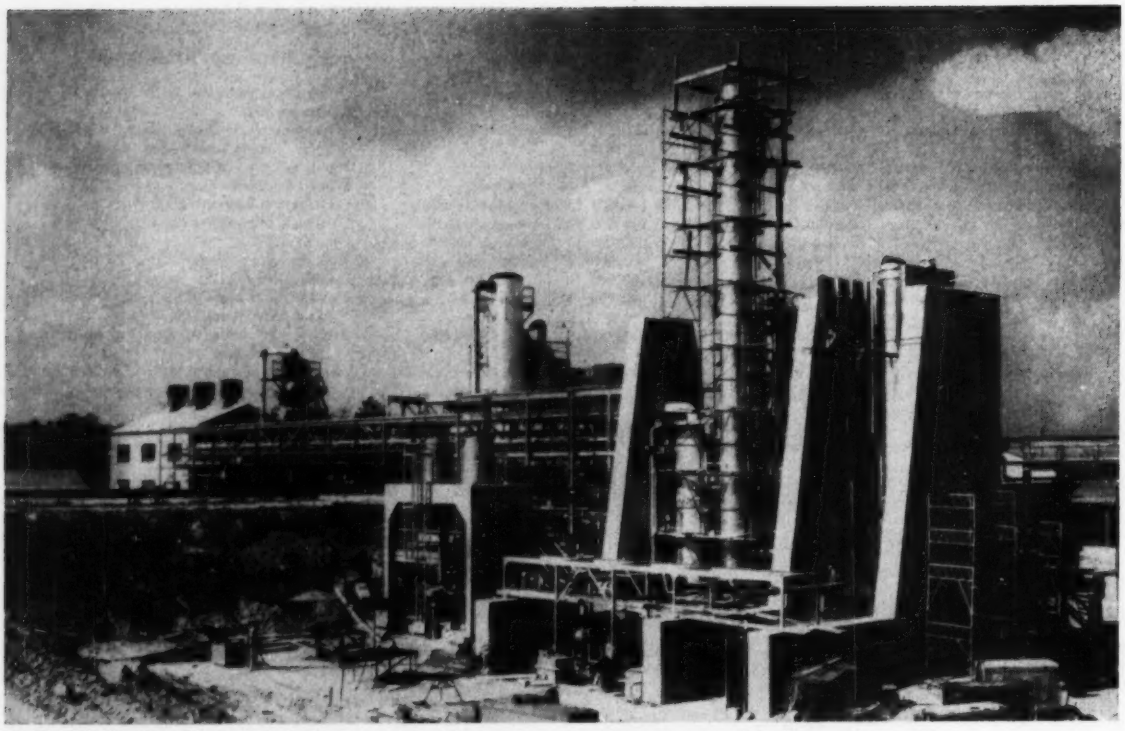
FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Allied Chemical & Dye	Hopewell, Va	8,000,000	Ammonia	In operation as of Oct. '53. Increases capacity 17%.
Allied Chemical & Dye	La Platte, Nebr	25,000,000	Ammonia, urea	Under construction. Production scheduled for spring '54. 75,000 tons per year anhydrous ammonia.
Allied Chemical & Dye	South Point, Ohio	9,000,000	Nitrophosphate fertilizer, urea	Scheduled for completion fall '53. Doubling of urea capacity.
American Cyanamid	New York, N. Y.	900,000	Phosphate rock	Certificate of necessity granted.
Atlantic Refining			Ammonia	Scheduled to operate '54.
Brea Chemicals	Brea, Calif	13,000,000	Ammonia	Under construction. 200 tons per day. Construction scheduled for completion mid '54. Brea is subsidiary of Union Oil.
Columbia-Southern	Natrium, W. Va		Ammonia	Production scheduled for late '54. Will use hydrogen from electrolysis plant formerly burned as fuel. New producer.
Commercial Solvents	Sterlington, La	20,000,000	Ammonia, methanol, ammonium nitrate	Doubled ammonia-methanol capacity brought in as of Oct. '53. Ammonium nitrate also in production.
Consumer Cooperative	Lawrence, Kans	15,000,000	Nitrate fertilizers	Scheduled to operate by Jan. '55. 83,000 tons per year ammonium nitrate, 13,200 anhydrous ammonia, 13,200 of 40% nitrate solutions.
Davison	Bartow, Fla	12,000,000	Triple superphosphate	Scheduled to operate early '54. 200,000 tons per year.
Davison	New Albany, Ind	1,000,000	Granulated mixed fertilizer	Scheduled to operate late '53. Increased capacity.
Filtrol	Vernon, Calif	5,000,000	Ammonium sulfate	Slated for completion Jan. '54.
Food Machinery & Chemical (Niagara Chemical)	Wyoming, Ill		Agricultural chemicals	Will convert and rehabilitate gov't. plant (as of May '53).
Gates Brothers	Montpelier, Idaho	2,000,000	Phosphatic fertilizers	Certificate of necessity granted.
Grace Chemical	Woodstock, Tenn	19,000,000	Ammonia, urea	Scheduled for completion mid '54. 250 tons per day ammonia, 15 of urea.
Hooker Electrochemical			Ammonia	Scheduled to operate in '54.

AGRICULTURAL CHEMICALS (Cont'd)

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
International Minerals & Chemical	Bonnie, Fla	14,000,000	Superphosphates	Construction underway (as of Feb. '53). 100,000 tons per year.
International Minerals & Chemical	Carlsbad, N. M		Potassium sulfate	Expanding to increase output by 35,000 tons per year. Due to be completed in '54.
International Minerals & Chemical	Clarkesville, Tenn		Plant food mix	Due in fall '54. 20,000 tons per year.
International Minerals & Chemical	Somerset, Ky		Plant food mix	Will be doubled in size (as of April '53).
International Minerals & Chemical	Tuscola, Ill	10,500,000	Nitrophosphate fertilizer	Certificate of necessity granted.
Lange Brothers	Audrain County, Mo	8,000,000	Nitrophosphate fertilizer	Certificate of necessity granted.
Lion Oil	Luling, La	30,000,000	Ammonia, nitric acid	Due in May '54.
Lion Oil	El Dorado, Ark	400,000	Ammonium sulfate	Bulk storage completed.
Mathieson	Pasadena, Tex	1,200,000	Phosphatic fertilizers	Certificate of necessity granted.
Mathieson Mississippi		30,000,000	Fertilizer	Planned (as of April '53). Joint venture: Mathieson & Miss. River Fuel Corp.
Mill Creek Chemical	Salt Lake City, Utah	9,000,000	Anhydrous ammonia	Planned. To begin construction by early. '55. 180 tons per day.
Mississippi Chemical	Yazoo City, Miss	5,000,000	Ammonia, ammonium nitrate	Scheduled to operate in '54. Expansion from 120 to 180 tons per day ammonia, to 375 tons per day nitrate.
Missouri Farmers Assn	Joplin, Mo	3,500,000	Mixed fertilizer	Under construction since mid '53. Phosphoric acid capacity: 75 tons per day. 70,000 tons per year mixed fertilizers.
Monsanto	Texas City, Tex	16,800,000	Nitrogen	Certificate of necessity granted.
National Distillers	Tuscola, Ill	7,000,000	Ammonia, nitrogen compounds	Scheduled for production Jan. '55. 50,000 tons per year anhydrous ammonia. Nitrogen by air fractionation. Hydrogen from ethylene unit of National Petrochemicals.
National Farmers Union	Canon City, Colo	6,000,000	Triple superphosphate	Planned (as of April '53).
National Farmers Union	Carlsbad, N. M	10,000,000	Potash	Speculative so far (as of April '53).
Northern Chemical Industries	Sandy Point, Me	9,000,000	Ammonia, nitric acid, nitrophosphate	About to start construction (as of Oct. '53). 100–120 tons per day anhydrous ammonia.
Phillips Chemical	Pasadena, Tex	1,500,000	Ammonium sulfate	Completed during '53.
Phillips Chemical	Pasadena, Tex	29,000,000	Ammonia	Completed late '53.
Phillips Chemical	Pasadena, Tex	3,000,000	Triple superphosphate	405 ton a day plant completed during '53.
Piedmont Chemical	Athens, Ga		Ammonium sulfate	On stream Aug. '53. 10,000 tons per year.
E. Rauh & Sons	Tuscola, Ill	2,000,000	Nitrophosphate fertilizers	Certificate of necessity granted.
Rohm & Haas	Deer Park, Tex	1,300,000	Ammonium sulfate	Certificate of necessity granted.
F. S. Royster Guano	Barstow, Fla	3,000,000	Triple superphosphate	Planned (as of April '53). 70,000 tons per year. Certificate of necessity granted.
San Jacinto Chemical	Houston, Tex	1,600,000	Ammonia	Expansion planned (as of May '53).
Shell Chemical	Vernon, Calif		Ammonia	About ready to operate (as of Oct. '53). 150 tons per day.
Shell Chemical	Ventura, Calif	10,000,000	Ammonia	Scheduled to operate Nov. '53. 150 tons per day anhydrous ammonia.
J. R. Simplot	Pocatello, Idaho		Triple superphosphate	Working towards 90,000 tons per year.
Southeastern Chemical	Lamont, Ill	1,600,000	Nitrophosphate fertilizer	Certificate of necessity granted.
Southern Fertilizer & Chemical	Savannah, Ga	700,000	Phosphate fertilizer	Certificate of necessity granted.
Spencer Chemical	Vicksburg, Miss		Anhydrous ammonia	Scheduled to start up by Dec. '53. Partial oxidation process.
Texas City Chemicals	Texas City, Tex	6,000,000	Dicalcium phosphate	In operation. To reach high gear by Dec. '53. Wet process. 56,000 tons per year.
Texas Farm Products	Nacogdoches, Tex		Superphosphate	On stream late '52. 150 tons per 8 hr shift. Uses spent sulfuric from oil refineries.
I. P. Thomas & Son	Paulsboro, N. J	800,000	Phosphate fertilizers	Certificate of necessity granted.
U. S. Phosphoric Products	East Tampa, Fla	1,100,000	Ground phosphate rock	Certificate of necessity granted.
Utah Chemical	South Central, Utah	19,000,000	Ammonia, nitric acid, ammonium nitrate	To produce 278 tons per day ammonia (as of June '53).
Western Phosphate	Garfield, Utah	5,000,000	Phosphoric acid, concentrated superphosphate, ammonium phosphate	Scheduled on stream early '54. (Owned by Stauffer, AS & R. & Kennecott.)

CAUSTIC, CHLORINE, SODA ASH

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Allied Chemical & Dye (Solvay)	Baton Rouge, La	13,000,000	Soda ash	Expansion completed to boost production by one-third.
Allied Chemical & Dye (Solvay)	Moundsville, W. Va	15,000,000	Chlorine, caustic soda	Construction scheduled for completion late 1953.
Allied Chemical & Dye (Solvay)	Syracuse, N. Y	10,000,000	Soda ash	New facilities planned (as of early '53).
Columbia-Southern	Natrium, W. Va. & Corpus Christi, Tex.		Chlorine, caustic soda	Capacity at Corpus Christi doubled, at Natrium, upped 35 percent.
Diamond	Houston, Tex	9,000,000	Chlorine, caustic soda	Completed during '53.
Diamond	Painesville, Ohio	10,000,000	Chlorine, caustic soda	Expansion completed during '53.
Gulf Alkali	Baytown, Tex		Chlorine, caustic soda	Construction scheduled to be underway.—To use mercury cell.
Hercules Powder	Brunswick, Ga		Chlorine	Construction scheduled to be underway. Chlorine recovery plant.
Mathieson	Saltville, Va		Soda ash	Scheduled to be in operation. 50,000 tons per year. New coarse light ash for glass making.
Pennsalt	Calvert City, Ky	8,000,000	Chlorine, caustic soda	In production.
Velsicol	Memphis, Tenn	2,000,000	Chlorine, caustic, hydrogen, bleach	Work completed. 88,000 lb. liquid chlorine, 110,000 lb. caustic per day.
Westvaco	Westvaco, Wyo	19,500,000	Soda ash	In operation. Working towards free capacity of 1,000 tons per day.



HYDRAZINE—New plant of Matholin Corp., Lake Charles, La. First large commercial hydrazine plant in U. S.

COKE AND COAL CHEMICALS

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Allied Chemical & Dye	Chicago, Ill	500,000	Naphthalene and tar acids	Certificate of necessity granted.
Allied Chemical & Dye	Ironton, Ohio	300,000	Naphthalene	Certificate of necessity granted.
Koppers	Follansbee, W. Va	500,000	Coke-oven chemicals	Certificate of necessity granted.
Koppers	Fontana, Calif		Coke-oven chemicals	On stream early '53. To process 17,000,000 gal. per year heavy crude from Kaiser coke ovens.
Speer Carbon (International Graphite & Electrode)	Niagara Falls, N. Y		Coke	New rotary calciner installed. Coke for electrodes and anodes.

GASES

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Air Reduction	Buffalo, N. Y		Acetylene	50% expansion announced April '53.
Air Reduction	Butler, Pa		Liquid oxygen	100 tons per day oxygen. Also argon, nitrogen. Plans announced early '53.
Air Reduction	Niagara Falls, N. Y		Dry ice	10-15% expansion announced April '53.
Air Reduction	Riverton, N. J		Liquid oxygen, nitrogen, argon	To go into production in '54.
Allied Chemical & Dye	Hopewell, Va	350,000	Oxygen	Completed. Part of new plant to manufacture chlorine.
Anchorage Oxygen	Anchorage, Alaska	300,000	Hi-purity oxygen and acetylene	Certificate of necessity granted.
Brown Co	Berlin, N. H		Sulfur dioxide	First commercial fluidized bed unit part on stream end '52.
Burdett Oxygen	Youngstown, Ohio		Oxygen	New plant completed early '53. Capacity: 7,000,000 cubic ft. per mo. Size of plant to be doubled within next two years.
Corpus Christi Oxygen	Corpus Christi, Tex	350,000	Oxygen	Certificate of necessity granted.
Diamond Alkali	Houston, Tex	200,000	Hydrogen	Completed during '53.
Grace Chemical	Memphis, Tenn	1,000,000	Oxygen, nitrogen	Air separation unit; to be used in conjunction with ammonia—urea plant.
Liquid Carbonic	Chicago, Ill	225,000	Oxygen and acetylene	Certificate of necessity granted.
National Cylinder Gas	Tampa, Fla	230,000	Hi-purity oxygen	Certificate of necessity granted.
Sierra Oxygen	Reno, Nev	100,000	Oxygen, acetylene	Certificate of necessity granted.

METALS & ALLOYS

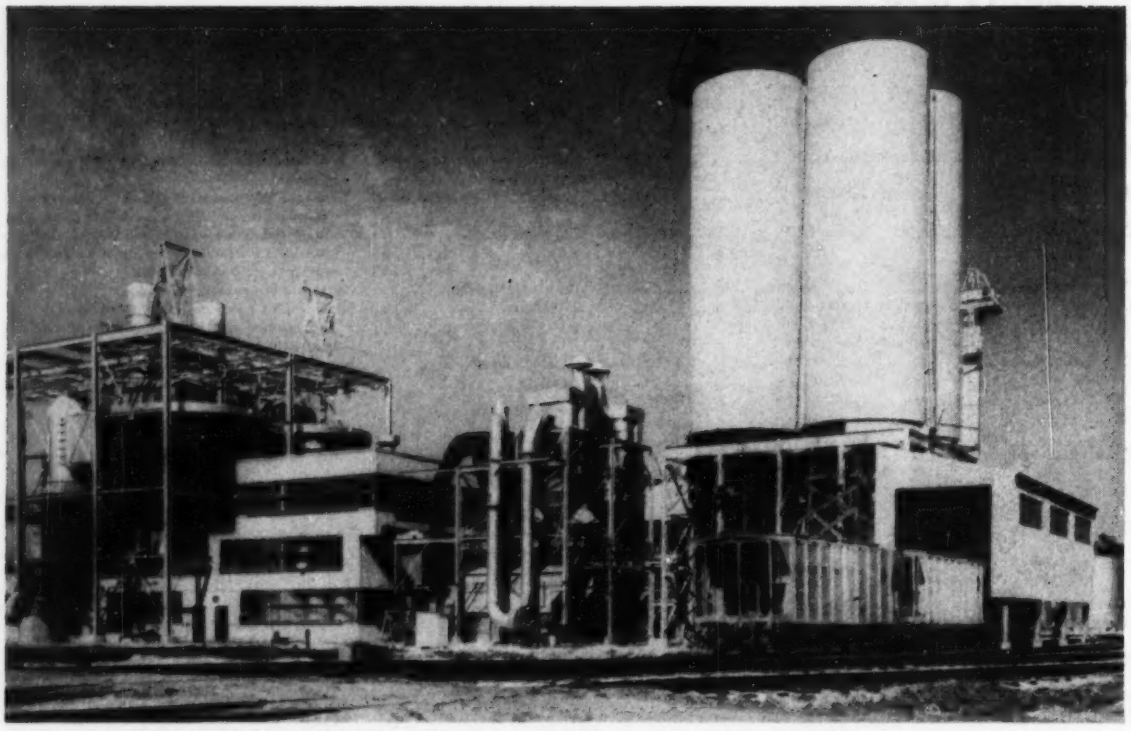
FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Alcoa	Rockdale, Tex		Aluminum	Third and fourth potlines scheduled on stream fall '53. Capacity all four: 170,000,000 lb. per year.
Alcoa	Wenatchee, Wash		Aluminum	Fourth potline put into operation early '53. Capacity of all four: 170 million lb. per year.

METALS & ALLOYS (Cont'd)

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Alleghany-Ludlum	.....	.....	Zirconium	Expansion underway. Strip and other shapes for atomic energy applications.
Apex Smelting	Springfield, Ore.	.....	Aluminum	Planned (as of Dec. '52). To use clay raw material.
Baker & Co	Newark, N. J.	800,000	Platinum metals	Certificate of necessity granted. Recovery and refining.
Blockson Chemical	Joliet, Ill.	600,000	Uranium	Certificate of necessity granted. Recovery of byproduct uranium from phosphate processing.
Carborundum Metals	Akron, N. Y.	2,500,000	Zirconium	Plant scheduled in operation mid '53. A.E.C. has placed $11 million in orders for zirconium to be supplied over 5 year period.
Climax Uranium	Grand Junction, Colo.	300,000	Uranium concentrates	Certificate of necessity granted.
Cramet (Gov't. contract)	Chattanooga, Tenn.	25,000,000	Titanium	Scheduled to be in partial production early '55. Will increase domestic production of titanium sponge by 6,000 tons per year.
Dow-Corning	Midland, Mich.	13,000,000	Metallic silicon	New electric furnace near completion as of May '53.
Du Pont	Newport, Del.	.....	Titanium	Major expansion underway. To be completed spring '54. Output of sponge to be increased by 13,500 tons over next 5 years (including Edge Moor production).
Fairmont Aluminum	Fairmont, W. Va.	32,500,000	Aluminum	Certificate of necessity granted. Plate, sheet, and foil.
General Electric (Gov't contract)	Hanford, Wash.	40,000,000	Plutonium	Expansion of chemical processing units to be completed in '55.
Hanna Coal & Ore	Riddle, Ore.	22,000,000	Ferro-nickel	To produce 95-125 million lb. nickel per year in form of ferronickel (25% Ni).
Harvey Machine	The Dalles, Ore.	35,000,000	Aluminum	To produce 54,000 tons per year in new reduction plant.
International Nickel	Huntington, W. Va.	140,000	Nickel alloys	Certificate of necessity granted.
Kaiser Aluminum & Chemical	Chalmette, La.	.....	Aluminum	All eight potlines scheduled onstream during '53. Full capacity: 400,000,000 lb. per year.
Kaiser Aluminum & Chemical	Mead, Wash.	5,000,000	Cryolite	Recovery operation. Scheduled for completion spring '53.
Kaiser Aluminum & Chemical	Mentor, Ky.	66,000,000	Aluminum	Certificate of necessity granted.
Kaiser Aluminum & Chemical	Tacoma, Wash.	3,000,000	Aluminum	Expanded facilities on stream Feb. '53. Output increased by 16,000,000 lb. per year to 70,000,000 lb. per year total for plant.
National Metallurgical	Springfield, Ore.	450,000	Aluminum-titanium silicon alloy	Certificate of necessity granted.
Ohio Ferro-Alloys	Brilliant, Ohio.	425,000	Ferrochrome	Certificate of necessity granted.
Olin Industries	.....	170,000,000	Aluminum	Planned. 110,000 tons per year. Site not named as of Aug. '53.
Pacific Northwest Alloys	Spokane, Wash.	.....	Ferrochrome	Started production. Scheduled to turn out 1.5 million lb. per month before end '53.
Rem-Cru Titanium	Midland, Pa.	.....	Titanium	Ground broken for expansion (as of Oct. '53). From present 3 to 10 ingot-tons per day by early '54.
Reynolds Metals	Gum Springs, Ark.	30,000,000	Aluminum	Contract awarded for new reduction plant late '52.
Reynolds Metals	Corpus Christi, Tex.	80,000,000	Aluminum	Completed during '53. 150 million lb. per year.
Reynolds Metals	Corpus Christi, Tex.	42,000,000	Alumina	Completed during '53. 1,000 tons per day.
Tennessee Products & Chemical	Chattanooga, Tenn.	.....	Ferromanganese	Expansion underway (as of Feb. '53). Electric furnace capacity to be doubled.
Tenn-Tex Alloy & Chemical	Houston, Tex.	.....	Ferroalloys	Three electric furnaces in operation. 2,500 tons per month.
Titanium Metals	Henderson, Nev.	.....	Titanium	Expansion towards goal of 10 tons per day.
U. S. Gov't. (A.E.C.)	Fernold, Ohio.	78,000,000	Purified uranium	Nearing completion (as of June '53.)
U. S. Vanadium	Uravan, Colo.	.....	Uranium ores	Capacity doubled late '52.
Union Carbide (Electromet)	Ashtabula, Ohio.	29,000,000	Ferroalloys and calcium carbide	Expansion program. First furnace started up. Work on six others underway.
Union Carbide (Electromet)	Marietta, Ohio.	125,000,000	Ferroalloys	Standard ferroalloys and ELC ferrochrome on stream. Will also produce electrolytic chromium and manganese when construction is completed.
Union Carbide (Electromet)	.....	.....	Titanium	Planned. 10,000 tons per year.
Union Carbide (Gov't contract)	Paducah, Ky.	1,000,000,000	Uranium 235	First unit in operation; second under construction.
Vanadium Corp	Graham Station, W. Va.	3,500,000	Low carbon ferrochrome	Certificate of necessity granted.
Vanadium Corp	Hite, Utah	3,000,000	Uranium ore	Planned (as of Dec. '52).
Vitro Chemical	Salt Lake City, Utah	.....	Uranium ore concentrates	Doubling of capacity to 350 tons ore per day planned (as of Nov. '52).
Wheland	Chattanooga area, Tenn.	70,000,000	Aluminum	Planned. 50,000 tons per year reduction plant.

PESTICIDES

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
California Spray-Chemical	San Jose, Calif.	.....	Insecticides	On stream.
Columbia-Southern	Barberton, Ohio.	.....	CIPC herbicide	Expanded facilities scheduled on stream early '53.
Diamond Alkali	Houston, Tex.	1,000,000	Lindane	Completed during '53.
Ethyl	Baton Rouge, La.	2,800,000	Lindane	New plant completed during '53.
Ethyl	Baton Rouge, La.	2,700,000	2, 4, 5-T	Now producing.
Geigy	McIntosh, Ala.	.....	DDT, benzene hexachloride	New plant scheduled for operation during '53.
John Powell	Atlanta, Ga.	.....	DDT, benzene hexachloride	New plant completed.
Monsanto	Santa Clara, Calif.	.....	CIPC herbicide	New plant in operation early '53.



FLUID CRACKING CATALYST—New plant of Davison Chemical Corp., Lake Charles, La. 60 tons per day catalyst.

PESTICIDES (Cont'd)

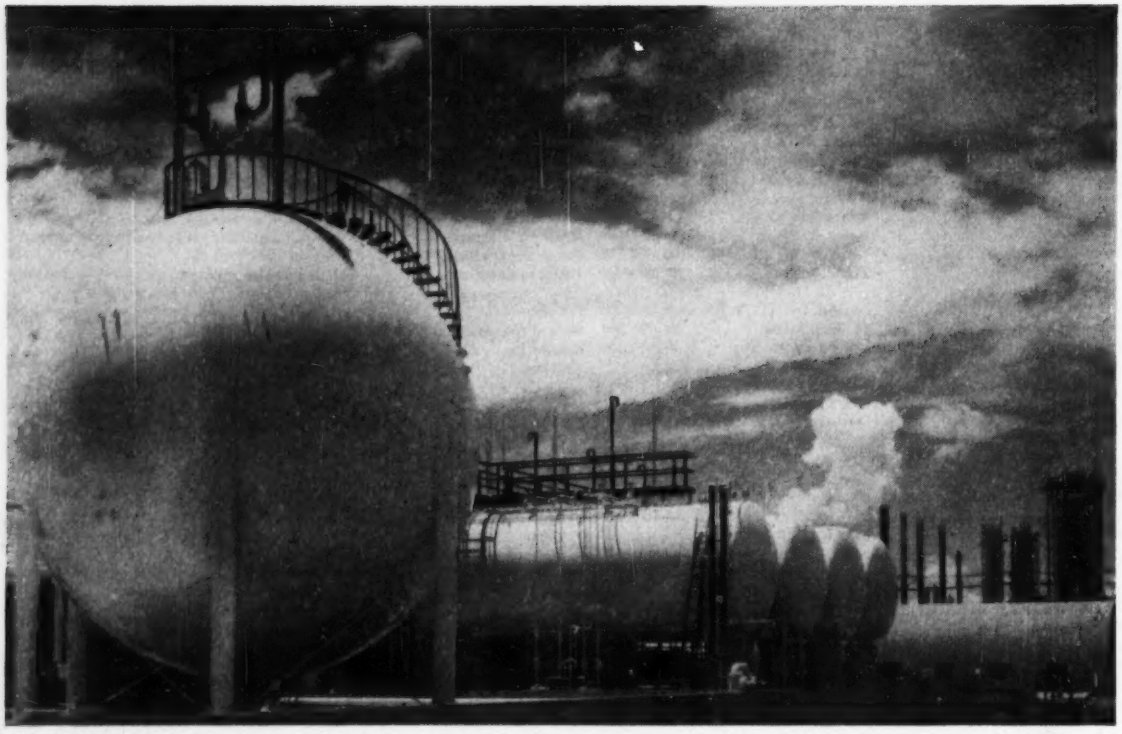
FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Northeastern Chemical	Westbrook, Me	.....	Herbicides, fungicides	In operation. Initial capacity: 20 tons per day dry product, 5,000 gal. per day liquid.
Panogen	Boulder, Colo	100,000	Fungicides	Certificate of necessity granted.
Pennsalt	Calvert City, Ky	2,000,000	Benzene hexachloride	Scheduled for operation early '54. New continuous process.
Pittsburgh Agricultural Chemical	Neville Island, Pa	.....	CIPC herbicide	New plant scheduled for operation early '54.
U. S. Industrial Chemicals	Baltimore, Md	.....	Allethrin	New plant on stream. 75,000 lb. per year.
U. S. Industrial Chemicals	Baltimore, Md	.....	CIPC herbicide	New plant scheduled for completion late '53. Phosgene raw material.
Union Carbide	Niagara Falls, N. Y.	1,300,000	Herbicide	Certificate of necessity granted.
Union Carbide (Carbide & Carbon)	Institute, W. Va	.....	Allethrin	Construction scheduled to be completed early '54. 500,000 lb. per year.

PETROLEUM & NATURAL GAS PRODUCTS

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Amerada Petroleum	Tulsa, Okla	100,000	Natural gasoline	Certificate of necessity granted.
Amerada Petroleum	Williston, N. D.	10,000,000	Natural gasoline	Planned as of Oct. '53.
American Mineral Spirits	Toledo, Ohio	3,700,000	Aviation alkylates	Certificate of necessity granted.
American Oil	Texas City, Tex	.....	Alkylate	Doubling capacity as of Oct. '53.
Atlantic Refining	Lea County, N. M.	4,000,000	Refined petroleum	Certificates of necessity granted.
Atlantic Refining	Philadelphia, Pa.	5,600,000	Refined petroleum	Completing, as of Oct. '53. Two stage pipe still. Cat, alky, and poly units.
Bay Petroleum	Denver, Colo	Multi-million	Refined petroleum	Expansion and modernization completed Sept. '53.
California Oil	Perth Amboy, N. J.	9,000,000	Petroleum products	Certificate of necessity granted.
Caminol	Hanford, Calif	1,600,000	Petroleum refining	Certificates of necessity granted.
Cities Service	Gaines, Tex	1,500,000	Refined petroleum	Certificates of necessity granted.
Cities Service	Chicago, Ill	.....	Alkylate	Expanding facilities. To complete June '54.
Cities Service	Lake Charles, La	.....	Alkylate	Expanding facilities. Complete June '54.
Cities Service	E. Chicago, Ill	10,000,000	Petroleum products	Plans announced for expansion Jan. '53. To add 15,000-20,000 bbl. per day to capacity.
Cities Service	Houma, La	2,800,000	Natural gasoline	Plans announced late '52.
Cities Service	Lake Charles, La	7,000,000	Reformate	Under construction. Due in '54. Fluid hydroformer.
Col-Tex Refining	Colorado City, Tex	1,000,000	Petroleum products	Certificate of necessity granted.
Continental Carbon	Eunice, N. M	2,400,000	Natural gasoline	Certificates of necessity granted.
Continental Oil	Lake Charles, La	1,500,000	Natural gasoline	Expansion scheduled for completion early '54. Processing capacity to be increased from 27 to 90 million cubic ft. per day gas.
Continental Oil	Ponca City, Okla.	7,500,000	Refined petroleum	Expansion. Under construction as of Oct. '53.
Cosden Petroleum	Big Springs, Tex	3,000,000	Aviation alkylate	Certificates of necessity granted.

PETROLEUM & NATURAL GAS PRODUCTS (Cont'd)

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Crown Central Petroleum	Houston, Tex	3,000,000	Aviation alkylate	Certificates of necessity granted.
Dakota Oil & Refining	Minot, N. D	1,200,000	Refined petroleum	Certificates of necessity granted.
Danaho Refining	Pettus, Tex	2,800,000	Petroleum refining	Certificates of necessity granted.
Davison	Cincinnati, Ohio	600,000	Petroleum refining	Certificates of necessity granted.
Deep Rock Oil	Cushing, Okla	2,500,000	Solvent lube oil	In operation July '53.
Derby Oil	Wichita, Kans	2,700,000	Aviation alkylate	Certificates of necessity granted.
Douglas Oil	Bakersfield, Calif	600,000	Refined petroleum	Certificate of necessity granted.
Eastern States Petroleum	Houston, Tex	4,000,000	Refined petroleum	Expansion and reactivation completed during '53.
General Petroleum	Ferndale, Wash	35,000,000	Petroleum products	Underway as of Dec. '52.
General Petroleum	Torrance, Calif	10,000,000	Petroleum products	New Thermofor catalytic reformer to be completed July '54. 1,900 bbl. per day.
Globe Oil & Refining	Lemont, Ill	2,000,000	Petroleum refining	Certificates of necessity granted.
Great Northern	St. Paul, Minn	26,000,000	Refined petroleum	Planned as of Oct. '53.
Great Northern	Corpus Christi, Tex	5,000,000	Reformate	Completed. Platforming and Udex units.
Gulf Oil	Philadelphia, Pa		Gasoline	Construction underway as of Feb. '53. World's largest fluid cat cracker. Fresh feed capacity 63,000 bbl. per day.
Gulf Oil	Port Arthur, Tex	12,000,000	Gasoline	Under construction as of Feb. '53. New catalytic reforming unit. To double plant's output of aviation gasoline.
Gulf Refining	St. Landry Parish, La	5,600,000	Natural gasoline	Certificates of necessity granted.
Hancock Oil	Long Beach, Calif	3,500,000	Petroleum refining	Certificates of necessity granted.
Humble Oil & Refining	Baytown, Tex	5,000,000	Aviation gasoline	Complete May '54. Cat. polymerization unit.
Humble Oil & Refining	Baytown, Tex		Petroleum products	Construction started late '52 on new-type solvent desasphalting plant. 28,000 bbl. per day vacuum reduced crude. Due in early '54.
Humble Oil & Refining	Baytown, Tex		Aviation gasoline	Catalytic light end unit due in early '54.
International Refineries	Wrenshall, Minn	9,500,000	Petroleum refining	Certificates of necessity granted.
Kerr-McGee Oil Ind	Wynnewood, Okla	4,000,000	Petroleum refining	Certificates of necessity granted.
Lion Oil	El Dorado, Ark	5,000,000	Alkylate	Put into operation late '53. 1,150 bbl. per day.
Lion Oil	El Dorado, Ark		Refined petroleum	Fluid cat cracker put into operation during '53.
Lion Oil	El Dorado, Ark	250,000	LPG-propane	Certificate of necessity granted.
Lone Star Gas	Fort Worth, Tex	600,000	Natural gasoline	Construction scheduled complete summer '53 Initial capacity: 45,000,000 cubic ft. gas per day.
Magnolia Petroleum	Beaumont, Tex	10,000,000	Reformate	Under construction. Due in '54.
Magnolia Petroleum	Dallas, Tex	1,100,000	Refined petroleum	Certificates of necessity granted.
McMurrey Refining	Tyler, Tex	8,000,000	Refined petroleum	Certificates of necessity granted.
Mid-Continent Petroleum	Tulsa, Okla	500,000	Petroleum products	Certificate of necessity granted.
Mid-Continent Petroleum	Tulsa, Okla	3,000,000	Petroleum refining	Certificates of necessity granted.
Mid-Continent Petroleum	Tulsa Co., Okla	400,000	Aviation alkylate	Certificate of necessity granted.
Natural Gasoline	Hawkins, Tex	900,000	Gasoline	Contract awarded for expansion late '52.
Oklahoma Carbon	Cushing, Okla	4,500,000	Refined petroleum	Certificates of necessity granted.
Old Dutch Refining	Muskegon, Mich	100,000	Refined petroleum	Certificate of necessity granted.
Onyx Refining	Jones Co., Tex	600,000	Petroleum refining	Certificate of necessity granted.
Pacific Oil & Refining	Tacoma, Wash	5,000,000	Refined petroleum	Scheduled for completion fall '54.
Pan American Refining	Podricktown, N. J	25,000,000	Petroleum refining	Certificates of necessity granted.
Pan American Refining	Texas City, Tex	8,500,000	Refined petroleum	To be on stream fall '54.
Pan American Refining	Goodwin Neck, Va		Refined petroleum	To begin construction in 6 months (as of Sept. '53)
Pan-Am Southern	El Dorado, Ark		Reformate	Will build fixed-bed hydroformer (as of Oct. '53)
Pan-Am Southern	Destrehan, La		Reformate	First commercial fluid hydroformer ready to operate as of Dec. '52. 2,000 bbl. per day
Pennsoil	Rouseville, Pa	1,500,000	Refined petroleum	Certificate of necessity granted.
Permian Petroleum	Levelland, Tex	3,600,000	Petroleum refining	Certificates of necessity granted.
Phillips Petroleum	Andrew Co., Tex	500,000	Natural gasoline	Certificate of necessity granted.
Phillips Petroleum	Borger, Tex	15,500,000	Petroleum refining	Completed. Expansion of alkylation facilities.
Phillips Petroleum	Brazoria Co., Tex	500,000	Natural gas processing	Certificate of necessity granted.
Phillips Petroleum	Dumas, Tex	200,000	Gasoline	Certificate of necessity granted.
Phillips Petroleum	Ector Co., Tex	2,000,000	Natural gasoline	Certificate of necessity granted.
Phillips Petroleum	Moore Co., Tex	700,000	Natural gasoline	Certificate of necessity granted.
Phillips Petroleum	Upton Co., Tex	5,000,000	Petroleum products	Certificate of necessity granted.
Phillips Petroleum	Woods Cross, Utah	10,000,000	Petroleum products	On stream early '53. Catalytic cracking plant. Crude to stills increased to 10,000 bbl. per day.
Phillips Petroleum	Bartlesville, Okla		Alkylate	Completing 3,600 bbl. per day expansion as of Oct. '53.
Phillips Petroleum		4,000,000	Natural gasoline	Certificates of necessity granted.
Pontiac Refining	Corpus Christi, Tex	1,100,000	Petroleum refining	Certificate of necessity granted.
Premier Oil Refining	Longview, Tex	250,000	Refined petroleum	Cat. polymeriser added in expansion early '53.
Proven Oil Refining	Florence, Ariz	18,000,000	Petroleum products	Contract awarded for new refinery late '52.
Pure Oil	Andrews Co., Tex	700,000	Petroleum refining	Certificate of necessity granted.
Pure Oil	Heath, Ohio		Catalytic reforming	Contract let Sept. '53. Process 3,000 bbl. naphthas per day from 33 to 98 octane.
Reef Fields Gasoline	Howard & Borden Cos., Tex.	250,000	Natural gasoline	Certificate of necessity granted.
Richfield Oil	Watson, Calif	43,000,000		Under construction. Refinery expansion.
Rock Island Refining	Indianapolis, Ind	600,000	Gasoline	Certificate of necessity granted.
Rothschild Oil	Santa Fe Springs, Calif	200,000	Refined petroleum	Certificates of necessity granted.
Shell Oil	Anacortes, Wash	75,000,000	Refined petroleum	Contract let Oct. '53. In operation mid '55. 50,000 bbl. per day refinery. Crude oil fractionating unit, platformer, cat cracker.
Shell Oil	Beckham Co., Tex	1,500,000	Natural gas processing	Certificates of necessity granted.
Shell Oil	Denver City, Tex	750,000	Refined petroleum	Certificates of necessity granted.
Shell Oil	Elk City, Okla		Gasoline	Contract for second major expansion awarded. Scheduled for completion spring '54.



BUTADIENE—New plant of Dow Chemical Co., Freeport, Tex. From crude butadiene obtained in manufacture of ethylene.

PETROLEUM AND NATURAL GAS (Cont'd)

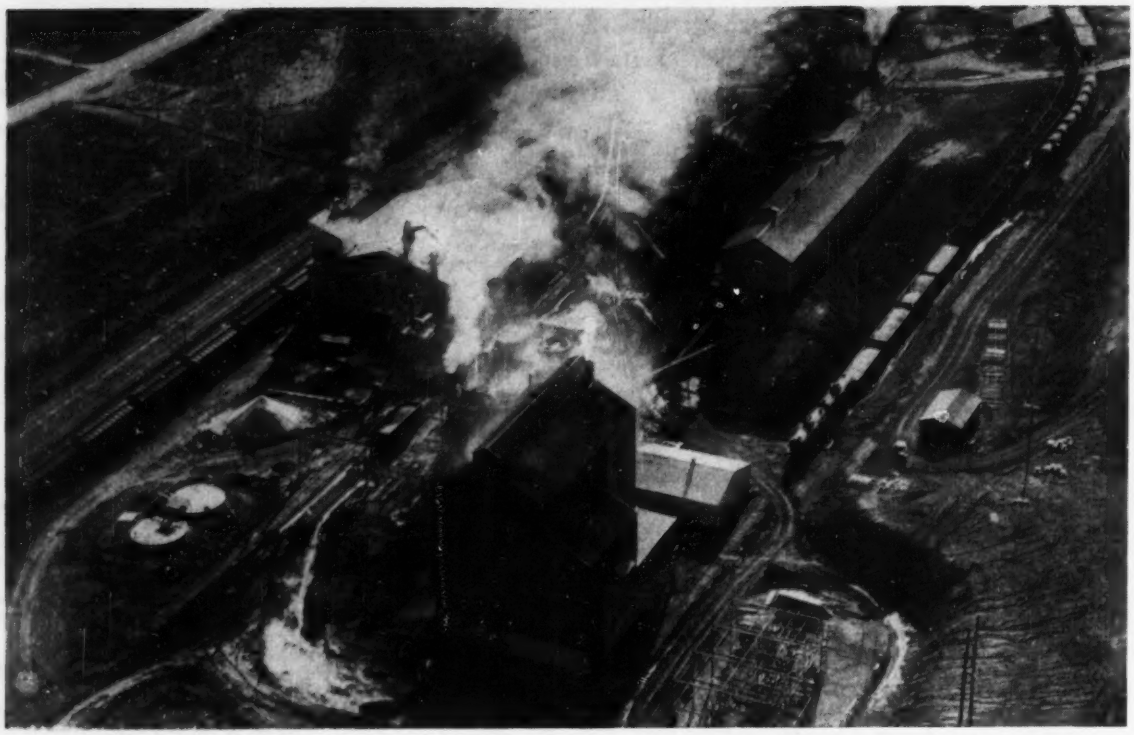
FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Shell Oil	Houston, Tex.	8,500,000	Petroleum products	Certificates of necessity granted.
Shell Oil	Martinez, Calif.	400,000	Gasoline	New crude distillation column and acid-treating unit on stream late '52. Refinery's capacity boosted to 70,000 bbl. per day.
Shell Oil	Wood River, Ill.	42,500,000	Refined petroleum	Under construction. Due to be completed late '54. Expansion and improvement.
Shell Oil	Martinez, Calif.	2,000,000	Petroleum refining	Certificates of necessity granted.
Shell Oil	Ventura, Calif.	1,000,000	Natural gasoline	Scheduled for completion Sept. '53. Capacity increase: one-third.
Shell Oil	Norco, La.	41,000,000	Petroleum refining	Under construction. Expansion due to be completed fall '54.
Shell Oil	Wood River, Ill.		Alkylate	Scheduled for completion end '53.
Shell Oil	Houston, Tex.		Alkylate	Scheduled for completion end '53.
Shell Oil	Martinez, Calif.	1,700,000	Reformed petroleum	Scheduled for completion July '54. 4,500 bbl. per day unit. Shell's third platformer.
Signal Oil & Gas	Tioga, N. D.	9,500,000	Refined petroleum	Certificates of necessity granted.
Sinclair Refining	Houston, Tex.	35,000,000	Aviation gasoline	New series of refining units installed as of Oct. '53. Designed to double output.
Sinclair Refining	Marcus Hook, Pa.	14,000,000	Refined petroleum	Plans announced April '53.
Sinclair Refining	Sinclair, Wyo.	500,000	Petroleum products	Certificate of necessity granted.
Sinclair Refining	Trainer, Pa.	14,000,000	Petroleum refining and alkylate	Certificates of necessity granted.
Skelly Oil	Eunice, N. M.	2,200,000	Natural gas processing	Certificates of necessity granted.
Skelly Oil	Lea Co., N. M.	3,000,000	Refined petroleum	Certificates of necessity granted.
Socony-Vacuum	E St. Louis, Ill.	8,000,000	Petroleum refining	Certificates of necessity granted.
Socony-Vacuum	Manderson, Wyo.	5,000,000	Natural gasoline	Projected as of Oct. '53.
Socony-Vacuum	Trenton, Mich.	2,000,000	Gasoline	Certificate of necessity granted.
Socony-Vacuum	Paulsboro, N. J.	250,000	Alkylate	Certificates of necessity granted.
Southern Production & Humble Oil	Angleton, Tex.	5,000,000	Gasoline	Contract awarded late '52. High-pressure absorption gasoline refining plant.
Standard Oil (Calif.)	El Segundo, Calif.		Reformate	New 12,000 bbl. per day. Platforming unit on stream late '52. Produces high octane motor fuels and aromatic concentrates.
Standard Oil (Calif.)	Richmond & El Segundo, Calif.	30,000,000	Reformate	Scheduled complete '54. Refinery expansion. 2 large cat. reformers.
Standard Oil (Calif.)	El Segundo, Calif.	20,000,000	Gasolines	Scheduled to build (as of late '52). New catalytic cracker. 36,000 bbl. per day.
Standard Oil (Ind.)	Casper, Wyo.		Petroleum alkylate	Scheduled for initial operation May '54. New 700 bbl. per day alkylation unit.
Standard Oil (Ind.)	Casper, Wyo.	1,600,000	Aviation alkylate	Certificates of necessity granted.
Standard Oil (Ind.)	Mandan, N. D.	23,000,000	Refined petroleum	Scheduled to operate Oct. '54. Capacity of new refinery: 30,000 bbl. per day.

PETROLEUM & NATURAL GAS PRODUCTS (Cont'd)

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Standard Oil (Ind.)	Whiting, Ind		Reformate	About to start construction on fluid catalytic hydroformer. Completion set for end '54.
Standard Oil (Ind.)	Whiting, Ind		Detergent alkylate	In operation Sept. '53. Catalytic combination of benzene and propylene tetramer.
Standard Oil (N. J.)	Baltimore, Md	300,000	Aviation alkylate	Certificate of necessity granted.
Standard Oil (N. J.)	Baton Rouge, La	900,000	Aviation alkylate	Certificate of necessity granted.
Standard Oil (N. J.)	Bayway, N. J		Petroleum products	Construction scheduled to start mid '53 on 60,000 bbl. per day crude distillation unit.
Standard Oil (N. J.)	Everett, Mass	600,000	Petroleum refining	Certificates of necessity granted.
Standard Oil (Ohio)	Lima, Ohio	12,000,000	Refined petroleum	Due in May '54.
Standard Oil (Ohio)	Cleveland, Ohio	12,000,000	Refined petroleum	Due in mid '54.
Standard Oil (Ohio)	Toledo, Ohio	3,000,000	Alkylate	Plant opened Sept. '53. Second such unit. 3,000 bbl. per day. Butane feed stock.
Standard Oil (Tex.)	El Paso, Tex	10,000,000	Gasoline	Expansion completed late '52. Includes Houdriflow catalytic cracker rated at 11,500 bbl. per day.
Stanoline Oil & Gas	Andrews, Tex	400,000	Natural gasoline	Certificate of necessity granted.
Stonewall Gas Products	Aspermont, Tex	3,000,000	Natural gas processing	Certificates of necessity granted.
Sun Oil	Marcus Hook, Pa	8,700,000	Refined petroleum	Completed as of Oct. '53.
Sun Oil	Toledo, Ohio	7,200,000	Reformate	Completing platforming unit as of Oct. '53.
Sunland Refining	Bakersfield, Calif	350,000	Petroleum refining	Certificates of necessity granted.
Sunray Oil	Bossier Parish, La	900,000	Natural gas	Certificates of necessity granted.
Sunray Oil	Corpus Christi, Tex	16,000,000	Refined petroleum	In operation during '53. 25,000 bbl. per day crude.
Sunray Oil	Duncan, Okla	1,000,000	Reformate	Platformer under construction. Due in late '54. To produce high-grade blending agent for upgrading motor gasolines.
Suntide Refining	Corpus Christi, Tex	11,000,000	Petroleum products	In operation during '53. 30,000 bbl. crude topping unit, vacuum unit, and 15,000 bbl. per day catalytic cracker.
Superior Refinery Owners	Superior, Wisc	400,000	Petroleum refining	Certificate of necessity granted.
Taylor Oil & Gas	Corpus Christi, Tex		Reformate	Platformer on stream recently (as of Sept. '53). 5,000 bbl. per day.
Tennessee Production	Agua Dulce, Tex	2,000,000	Natural gasoline	Construction to begin soon (as of Jan. '53). 70,000 gal. per day natural gasoline and LPG.
Texas Co	Amarillo & El Paso, Tex.		Refined petroleum	Crude oil running capacity to be doubled by late '54.
Texas Co	Port Arthur, Tex	16,000,000	Reformate	Site being cleared for catalytic reforming unit (as of June '53).
Texas Co	Los Angeles, Calif	1,400,000	Natural gasoline	Certificates of necessity granted.
Texas Co	Scurry Co., Tex	1,000,000	Propane, butane, natural gasoline	Certificate of necessity granted.
Texas Co	Westville, N. J	12,000,000	Petroleum refining	Certificates of necessity granted.
Texas City Refining	Texas City, Tex	2,500,000	Refined petroleum	Largest Houdriflow unit in world dedicated Oct' '53. Soon to reach full capacity of 19,000 bbl. per day.
Tide Water Associated Oil	Avon, Calif	1,300,000	Refined petroleum	Certificate of necessity granted.
Ucan Products	Sunday Village, Okla		Petroleum coke	Scheduled for completion late '54. Will operate in conjunction with Sunray's catalytic cracking refinery.
United Refining	Warren, Pa	1,000,000	Gasoline, high-octane	New "cat-forming" plant announced Feb. '53. To operate by end '53. 2,500 bbl. per day blending stock.
Warren Petroleum	Antioch, Okla	2,000,000	Gasoline	Certificates of necessity granted.
Warren Petroleum	Lovington, N. M	4,000,000	Natural gasoline	Under construction. To be completed Feb. '54. Daily production: 30,000 gallons natural gasoline, 15,000 gallon butanes.
Warren Petroleum	Panther Creek, Okla	600,000	Propane, butane, natural gasoline	Certificate of necessity granted.
Williston Basin Refining	Williston, N. D	400,000	Refined petroleum	Certificate of necessity granted.

PHARMACEUTICALS

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Armour	Bradley, Ill	12,000,000	Pharmaceuticals	Entire plant scheduled to be in operation by end '53.
Blackman Brands	S. Hackensack, N. J		Barbiturates, mercurials, epinephrine	New plant completed. 4,000 lb. per month.
Cutter Laboratories	E. Chattanooga, Tenn	100,000	Intravenous solutions	Certificate of necessity granted.
Don Baxter	Glendale, Calif	100,000	Serums and plasma	Certificate of necessity granted.
Eli Lilly	Lafayette, Ind		Antibiotics	Scheduled for completion mid '53. Stand-by basis.
Hyland Laboratories	Los Angeles, Calif	750,000	Blood derivatives and gamma globulin	Certificates of necessity granted.
Lakeside Laboratories			Pharmaceutical	Addition to plant planned as of Aug. '53.
Merck	Albany, Ga		Sulfanilamide	On stream early '53.
Minnichlor	Enfield, Minn		Water-soluble chlorophyll	In production late '52. 75-100 lb. chlorophyll per day.
National Chlorophyll & Chemical	Lamar, Colo	1,000,000	Chlorophyll	Project abandoned after breaking ground.
Norwich Pharmacal	Norwich, N. Y	150,000	Aspirin	On stream.
Stauffer Chemical	San Luis, Calif	2,800,000	Citric acid	Certificate of necessity granted.



DICALCIUM PHOSPHATE—New plant of Shea Chemical Corp., Columbia, Tenn. Capacity: 250 tons per day dicalcium phosphate.

PHOSPHORUS, PHOSPHORUS COMPOUNDS

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Food Machinery & Chemical	Carteret, N. J.	100,000	Potassium phosphates	Certificate of necessity granted.
Monsanto	Monsanto, Ill.	1,000,000	Phosphorus oxychloride	Certificate of necessity granted.
Monsanto	Monsanto, Idaho		Phosphorus	Plans announced for second furnace. Will bring company total to eight (six at Monsanto, Tenn.).
Monsanto	Soda Springs, Idaho		Phosphorus	New electric furnace on stream.
Shea Chemical	Columbia, Tenn	3,500,000	Phosphorus and derivatives	On stream early '53. 20,000 tons per year phosphorus. 30,000-kw. furnace.
Victor Chemical	Morrisville, Pa		Phosphorus chlorides	Construction scheduled for completion early '54. Will more than double companys' present capacity for phosphorus oxychloride and phosphorus trichloride.
Victor Chemical	Silver Bow, Mont		Phosphorus	Second furnace scheduled for operation early '53.
Virginia-Carolina	Charleston, S. C		Alkyl phosphites	Semi-commercial unit on stream.
Virginia-Carolina	Cincinnati, Ohio	1,000,000	Phosphoric acid and phosphates	Construction scheduled for completion end '53.

PIGMENTS AND DYES

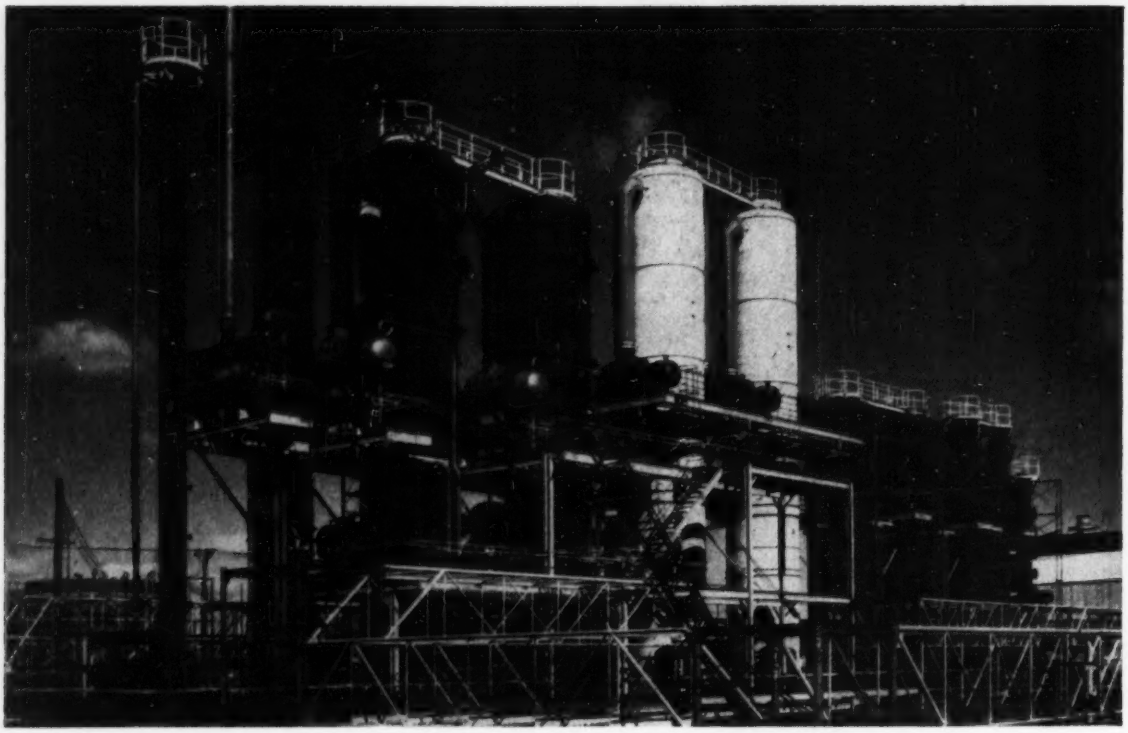
FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
American Cyanamid (Calco)	Savannah, Ga	14,000,000	Titanium dioxide pigments	Construction about to get underway.
Arnold, Hoffman	Providence, R. I.		Dyes and intermediates	Scheduled for completion end of 1953.
Ciba States, Inc	Toms River, N. J.	18,000,000	Vat dyestuffs	On stream summer '53. 4 million lb. per year anthraquinone-based paste dyestuffs.
Hilton-Davis	Cincinnati, Ohio		Colors	New facilities have increased plant capacity 15–20 percent.
New Jersey Zinc	Palmerton, Pa	15,000,000	Titanium dioxide	Certificate of necessity granted.
Southern Dyestuff	Charlotte, N. C	250,000	Dyestuffs	Expansion underway (as of Jan. '53).

PLASTICS & RESINS, ELASTOMERS

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Allied Chemical & Dye (Semet-Solvay)	Buffalo, N. Y.		Polyethylene-type polymer	Scheduled to go on stream mid '53. 20,000,000 lb per year.
American Cyanamid	Azusa, Calif		Polyester resins	Expansion completed (as of Feb. '53).
Catalin	Calumet City, Ill		Polystyrene molding powder.	About to start construction (as of June '53).
Ciba	Kimberton, Pa		Epoxy resins	Capacity doubled to 6 million lb. per year.
Colton Chemical	Cleveland, Ohio	250,000	Polyvinyl alcohol	On stream early '53.

PLASTICS & RESINS, ELASTOMERS (Cont'd)

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Diamond Alkali	Houston, Tex.	2,500,000	Polyvinyl chloride	Completed during '53.
Dow	Freeport, Tex.	11,000,000	Polyethylene	Scheduled to operate late '54 or early '55. To produce 25 million lb. per year.
Dow	Torrance, Calif.		Polystyrene	On stream Oct. '53.
Dow-Corning	Midland, Mich.	1,500,000	Silicone rubber	Under construction as of May '53. To increase capacity to 500,000 lb. per month.
Dow-Corning	Midland, Mich.	10,200,000	Silicone fluid and resins	Construction nearing completion as of May '53.
Dunlop Tire & Rubber		1,500,000	Foam rubber	Increased production as of March '53 from 2.5 to 7 million lb. per year.
Du Pont	Columbia, Tenn.		Cellulose sponge	New plant. Production underway as of Feb. '53.
Du Pont	Clinton, Iowa		Cellophane	Extensive modernization planned as of July '53.
Du Pont	Circleville, Ohio	15,000,000	Polyethylene terephthalate film	Under construction. Due for completion end of '54.
Du Pont	Parlin, N. J.		Polyethylene terephthalate	Under construction. Initial production mid '55. Photographic film base.
Du Pont	Richmond, Va.		Cellophane	Expanding and improving facilities, to be completed late '54.
Durez	N. Tonawanda, N. Y.		Phenolic resins	Capacity doubled as of July '53.
Eastman Kodak			Polyethylene	Planned as of May '53. 20 million lb. per year. I.C.I. patents.
Eastman Kodak	Atlanta, Ga.	3,000,000	Film	Plans announced March '53.
General Electric	Waterford, N. Y.	5,000,000	Silicones	Expansion completed early '53.
General Tire & Rubber	Ashtabula, Ohio	6,000,000	Polyvinyl chloride	Planned as of May '53.
Goodrich-Gulf Chemicals	Orange, Tex.		Butyl rubber	Will be built (as of April '53). First plant for Goodrich-Gulf. Esso patents.
Goodyear Tire & Rubber	Akron, Ohio	1,500,000	Synthetic rubber	Expansion. Construction underway as of Jan. '53.
Goodyear Tire & Rubber	Los Angeles, Calif.		Foam rubber	70% boost in production scheduled by Sept. '53.
Hercules Powder	Hopewell, Va.	1,800,000	Cellulose gum	Certificate of necessity granted.
Hooker-Detrex	Ashtabula, Ohio		Vinyl resins	Plans for new plant announced early '53.
Koppers	Potter Township, Pa.	1,700,000	Styrene resins	Certificate of necessity granted.
M. W. Kellogg	Jersey City, N. J.		Fluorochlorocarbon plastics	New plant in operation as of April '53. Will add well over 1 million lb. per year to supply.
Monsanto			Polyethylene	Plan 66 million lb. per year by '55, 99 by '57.
Monsanto	Springfield, Mass.		Hi-impact styrene	Will increase capacity by 30 million lb. per year. Operate spring '54.
Monsanto	Springfield, Mass.; Port Plastics, Ohio		Phenolic resin	Third expansion in less than a year announced May '53. To add 15% to capacity of the two plants.
Monsanto	Springfield, Mass.		Vinyl butyral interlayer	50% expansion announced April '53.
Monsanto	Indian Orchard, Mass.	2,700,000	Polyvinyl chloride	Film plant under construction as of Jan. '53.
National Petrochemical	Tuscola, Ill.		Polyethylene	Scheduled for completion '55. 50 million lb. per year. I.C.I. patents.
National Starch Products	Plainfield, N. J.		Polyvinyl acetate	Additional capacity installed early '53. Can double output of woodworking adhesives.
Pan American Refining	Texas City, Tex.	500,000	Petroleum polymer resins	Certificate of necessity granted.
Pan coat Milling	New Orleans, La.		Synthetic resins, casein glue, powdered metals	Production started as of Sept. '53.
Plax	Louisville, Ky.		Polyethylene plastic products	New plant in production as of Jan. '53.
Reichhold	Kansas City	1,000,000	Synthetic resins	To start construction when labor dispute ends (as of Aug. '53).
Reichhold	Elizabeth, N. J.	500,000	Synthetic resins	New 7,800-gallon, outdoor kettle in production late '52.
Reichhold	Houston, Tex.	3,000,000	Resins and phenolic products	Proposed.
Rubarite	Malvern, Ark.	300,000	Synthetic rubber	Soon to be built (as of June '53).
Shawinigan Resins	Springfield, Mass.		Vinyl resins	Increasing production 35% as of May '53.
Shell Chemical	Houston, Tex.		Epoxy resins	Scheduled to triple capacity by end '53.
Spencer Chemical	Orange, Tex.	25,000,000	Polyethylene	Construction underway.
Standard Oil (Ind.)	Whiting, Ind.		Polyester fiber and film	Scheduled to be on stream Jan. '55. 14 million lb. per year.
Texas Eastman	Longview, Tex.	3,800,000	Synthetic hard wax	Under construction.
Texas Eastman	Longview, Tex.	7,000,000	Polyethylene	Under construction.
U. S. Rubber	Port Neches, Tex.	2,500,000	Cold rubber	In production late '52. 7,500 long tons per month
U. S. Rubber	Naugatuck, Conn.		Polyester resins	Doubling capacity as of early '53.
U. S. Rubber	Painesville, Ohio	3,000,000	Vinyl resins	Scheduled for completion mid '53. Capacity doubled to over 50,000,000 lb. per year.
U. S. Rubber	Baton Rouge, La.	1,400,000	Styrene-acrylonitrile and rubber blends	Expansion underway. Scheduled for completion Jan. '54.
U. S. Rubber	Baton Rouge, La.	2,000,000	Synthetic rubber	Expansion completed Sept. '53.
Union Carbide	Bound Brook, N. J.	400,000	Epoxy resins	Certificate of necessity granted. Could mean 6 million lb. per year from present 1 million.
Union Carbide (Linde)	Long Reach, W. Va.	14,000,000	Silicones	Certificate of necessity granted. Scheduled to be under construction late '53.
Union Carbide (Bakelite)	South Charleston, W. Va.		Fluorothene resins	Completion scheduled for mid '53.
Union Carbide (Bakelite)	Marietta, Ohio	6,000,000	Polystyrene	Certificate of necessity granted.
Union Carbide (Bakelite)	Marietta, Ohio		Plastic materials	Work started on 9-unit plant as of July '53.
Union Carbide	Seadrift, Tex.	36,300,000	Polyethylene, ethylene oxide	Under construction.
Union Carbide	Texas City, Tex.	3,300,000	Polyethylene	Completed during '53.
Union Carbide	Torrance, Calif.	36,000,000	Polyethylene, ethylene glycol	Construction underway. To be completed early '55.
Vareum Chemical		500,000	Plastic resins	Scheduled to start construction soon (as of Sept. '53).
Williamson Adhesives	Skokie, Ill.	100,000	Industrial adhesives	Certificate of necessity granted.



VINYLTOLUENE—New plant of Dow Chemical Co., Midland, Mich. Can replace styrene in resins and synthetic rubber.

PULP & PAPER

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Bowaters Southern	Calhoun, Tenn.	51,000,000	Newsprint	Construction scheduled for completion early '54 Capacity: 50,000 tons kraft pulp and 125,000 tons newsprint per year.
East Texas Pulp & Paper	Silsbee, Tex.	2,000,000	Paper, pulp	Construction scheduled for completion late '54. 90,000 tons bleached sulfate pulp and paper board per year.
Great Northern Paper	Millinocket, Me.		Newsprint	Expansion planned (as of May '53). To make newprint from hardwood.
Hollingsworth and Whitney	Mobile, Ala.		Bleached paper	Increase of 150 tons per day planned (as of March '53).
International Paper	Camden, Ark.	2,000,000	Paper	Expansion planned. Current capacity: 500 tons per day.
International Paper	Tonawanda, N. Y.	300,000	Bleached soda pulp	Certificate of necessity granted.
New York and Pennsylvania	Johnsonburg, Pa.	2,500,000	Book and magazine paper	Certificate of necessity granted.
New York and Pennsylvania	Lock Haven, Pa.	2,000,000	Paper and bleached wood pulp	Certificate of necessity granted.
Puget Sound Pulp and Timber, American Viscose	Ward Cove, Alaska	46,000,000	Pulp	Planned. To use magnesia-base pulping.
Rayonier	Brunswick, Ga.	24,000,000	White wood pulp	Certificate of necessity granted.
Rayonier	Jesup, Ga.	25,000,000	Chemical cellulose	Under construction.
Rhinelander Paper	Rhinelander, Wisc.	700,000	Bleached semi-chemical pulp	Certificate of necessity granted.
St. Regis Paper	Jacksonville, Fla.		Kraft paper	On stream early '53. 100,000 tons per year. $4.5 million expansion planned to be completed mid '54.
Valentine Pulp & Paper	Lockport, La.	2,600,000	Pulp, newsprint	Scheduled for operation late '53. 50 tons pulp per day. New process to use sugar cane bagasse.
West Virginia Pulp & Paper	Charleston, S. C.	3,000,000	Semi-chemical pulp	Increase of 200 tons per day planned (as of March '53).

SULFUR & SULFURIC

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Allied Chemical & Dye (General Chemical)	Baton Rouge, La.		Sulfuric acid, trifluorochloroethylene	Completion scheduled for end '53. Contact sulfuric plant. New process for tri...
Allied Chemical & Dye (General Chemical)	Painesville, Ohio	3,300,000	Sulfuric acid	Scheduled to start production late '53.
American Sulphur & Refining	Millmore, Calif.	1,000,000	Sulfur	Planned as of April '53. 100 tons per day, 99.5% pure.
Anaconda Copper Mining	Anaconda, Mont.	1,400,000	Sulfuric acid	Certificate of necessity granted.

SULFUR & SULFURIC (Cont'd)

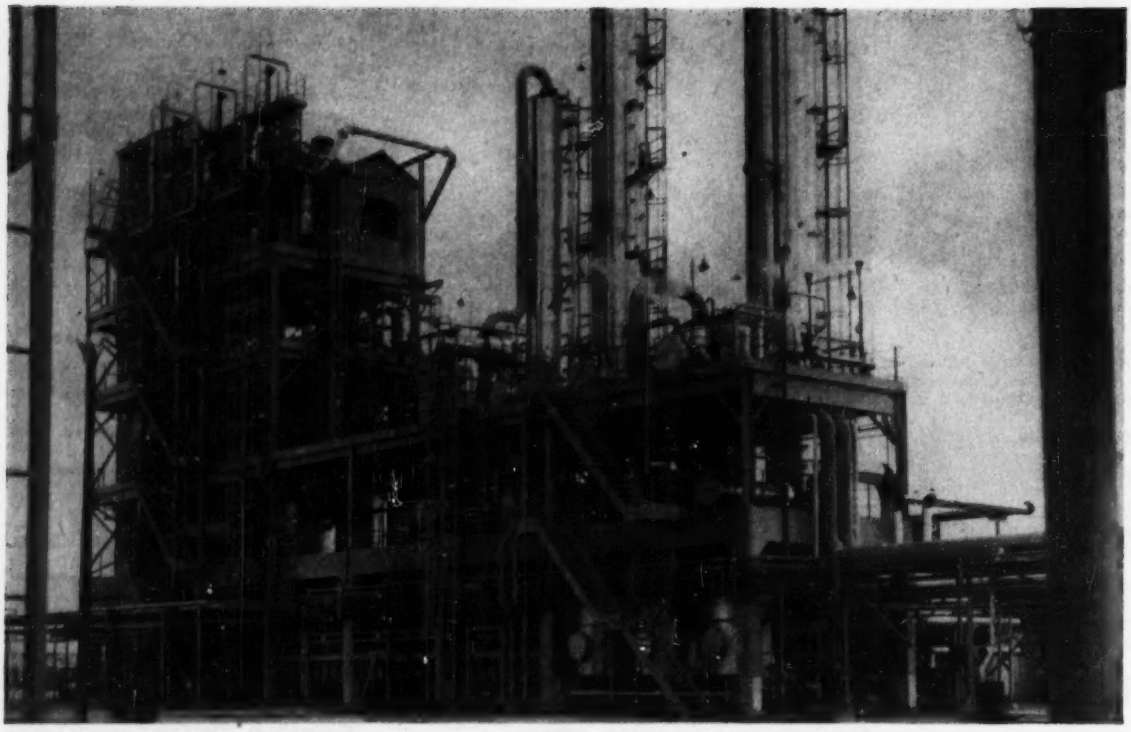
FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
J. T. Baker	Penn Yan, N. Y.		Sulfur	To recover 1,250,000 lb. sulfur per year from carbon bisulfide waste gases (as of late '52).
Brea Chemicals	Los Angeles, Calif.		Sulfur	Planned. From refinery waste gases.
Columbian Carbon	Seminole, Tex.	200,000	Sulfur	Certificate of necessity granted. From waste gas.
Consolidated Chemical Industries	Baton Rouge, La.	3,500,000	Sulfuric acid	On stream mid '53. From refinery sludge. 400 tons per day.
Consolidated Chemical Industries	Baytown, Tex.	4,750,000	Sulfuric acid	Scheduled to operate '54.
Davison Chemical	Nashville, Tenn.	950,000	Sulfuric acid	Certificate of necessity granted.
Eagle-Picher	Galena, Kans.	4,000,000	Sulfuric acid	Scheduled for completion early '54. 240 tons acid per day. To use gases from new zinc roasting plant.
Freeport Sulphur	Freeport, Tex.	2,700,000	Sulfur	Certificate of necessity granted.
Freeport Sulphur	Thibodaux, La.		Sulfur	Plans announced for new mine early '53.
Gates Bros.	Wendell, Idaho	800,000	Sulfuric acid	Certificate of necessity granted.
Gulf Oil	Port Arthur, Tex.		Sulfur	Put into operation late '52. 67 tons per day.
International Minerals & Chemical	Mason City, Iowa	400,000	Sulfuric acid	Certificate of necessity granted.
International Minerals & Chemical	Wilmington, N. C.	500,000	Sulfuric acid	Certificate of necessity granted.
Monsanto, Tide Water Assoc. Oil	Avon, Calif.	2,000,000	Sulfuric acid	On stream. 250 tons per day. From waste sludge and H_2S.
Phillips Chemical	Seminole, Tex.	250,000	Sulfur	Contract awarded (as of late '52); extraction plant.
Shell Chemical	Houston, Tex.		Sulfur	To recover 55 tons per day from refinery gases (as of Jan. '53).
Signal Oil & Gas	Tioga, N. D.	350,000	Sulfur	Certificate of necessity granted.
Sinclair Refining	Marcus Hook, Pa.		Sulfur	Completed. 21 tons per day.
Standard Sulphur	Damon, Tex.	450,000	Sulfur	Mobile mine scheduled to operate mid '53. 150–200 tons per day.
Stanolind Oil & Gas	North Cowden Field of West Tex.		Sulfur	On stream. 40,000 lb. per day from sour gas.
Stauffer	Compton, Calif.	500,000	Sulfuric acid	Certificate of necessity granted.
Stauffer	Monongahela, Pa.	1,000,000	Sulfur	Construction started Oct. '53. Crystex insoluble sulfur.
Stauffer	Whiting, Ind.	2,000,000	Sulfuric acid	Certificate of necessity granted.
Westvaco	South Charleston, W.Va.		Sulfur	Contract awarded (as of July '53). From hydrogen sulfide.
Wilshire Oil	Norwalk, Calif.	150,000	Sulfur	From waste gas. Certificate of necessity granted.

SYNTHETIC FIBERS

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Allied Chemical & Dye (National Aniline)	Hopewell, Va.	23,000,000	Nylon-6	Under construction. Capacity: 20,000,000 lb. per year.
American Enka	Enka, N. C.	2,000,000	Nylon	Under construction. Capacity: 2,000,000 lb. per year staple. Facilities for filament later.
American Enka	Lowland, Tenn.	4,000,000	Viscose rayon yarn	Expansion underway.
American Enka	Lowland, Tenn.	35,000,000	Nylon fiber	Certificate of necessity granted.
Du Pont	Kinston, S. C.	40,000,000	Dacron	Onstream. Annual goal: 35 million lb. per year.
Du Pont	Old Hickory, Tenn.	10–20,000,000	Dacron	Under consideration.
Union Carbide	Draper, N. C.	30,000,000	Dynel	Production snags have caused indefinite delay in construction.

SYNTHETIC ORGANICS

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Allied Chemical & Dye (Barrett)	Calumet, Ill.	5,000,000	Phthalic anhydride	In operation Aug. '53. 30 million lb. per year.
Allied Chemical & Dye (Barrett)	Philadelphia, Pa.		Phthalic anhydride	Soon to be completed (as of Oct. '53).
Allied Chemical & Dye (General Chemical)	Baton Rouge, La.		Trifluorochlorethylene	Under construction as of Oct. '53.
Allied Chemical & Dye (National Aniline)	Buffalo, N. Y.	1,200,000	Dye intermediates	Scheduled complete end '53.
Allied Chemical & Dye (National Aniline)	Moundsville, W. Va.	4,500,000	Maleic anhydride, fumaric acid	Under construction. Scheduled to operate early '54. To use catalytic oxidation of benzene.
Allied Chemical & Dye (National Aniline)	Moundsville, W. Va.	3,200,000	Aniline and nitrobenzene	Under construction as of Aug. '53.
Allied Chemical & Dye (National Aniline)	Hopewell, Va.		Adipic acid	Plans announced Sept. '53. For nylon and adipic esters.
Allied Chemical & Dye	Orange, Tex.	5,000,000	Ethylene oxide, glycols	Construction started late '52.
Allied Chemical & Dye (Solvay)	Moundsville, W. Va.	2,000,000	Methyl chlorides	Construction to be completed by April '54.
Allied Chemical & Dye (Solvay)	Orange, Tex.	5,000,000	Petrochemicals	Under construction. Due in spring '54.
American Cyanamid	Bridgeville, Pa.	6,000,000	Phthalic anhydride	Under construction. Almost complete as of Oct. '53. Will double present Cyanamid output to 48 million lb. per year.
American Cyanamid	Avondale, La.	8,000,000	Monomethylstyrene	Certificate of necessity granted.
American Cyanamid	Avondale, La.	55,000,000	Ammonia, acetylene, acrylonitrile	Scheduled for completion during '54. Sulphuric acid unit completed June '53. 100,000,000 lb per year acrylonitrile.
Ansul Chemical	Marinette, Wisc.		Synthetic pyridines	Scheduled for operation Nov. '53. Chief outlet: pharmaceuticals. Several hundred thousand lb per year refined pyridine, co-products.
Arapahoe Chemicals	Boulder, Colo.		Specialty organics	Plant to be completed soon (as of Feb. '53).



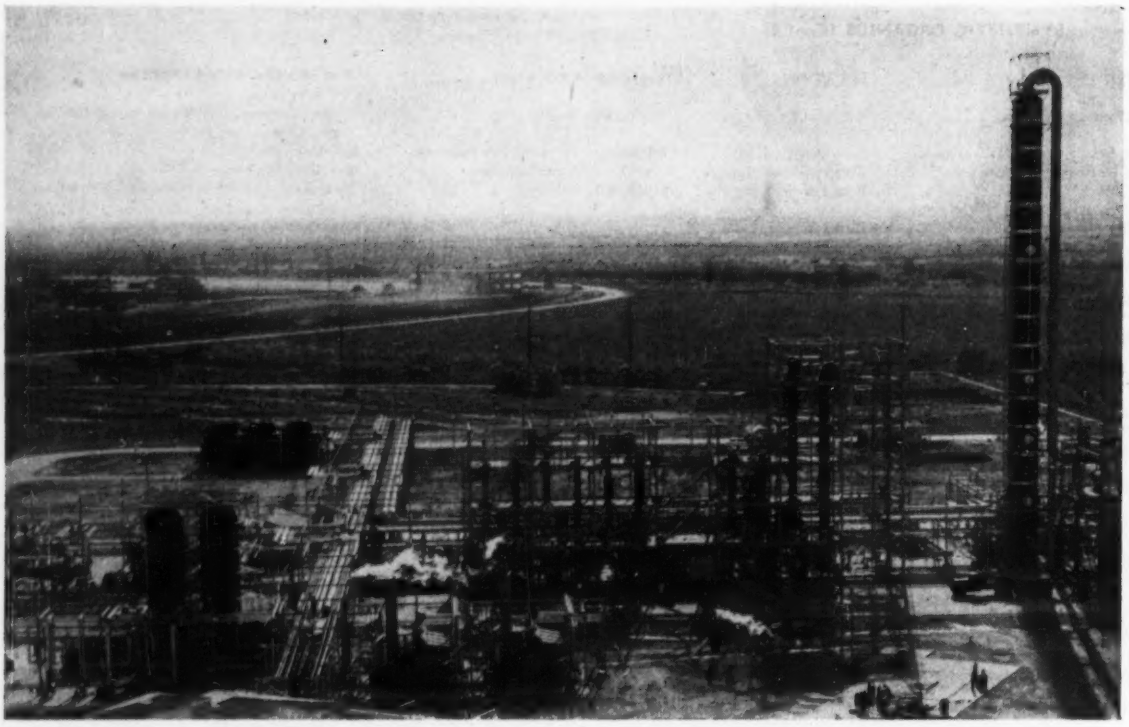
ETHYLBENZENE—New plant of Koppers Co., Port Arthur, Tex. Capacity: 90 million lb. per year.

SYNTHETIC ORGANICS

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Atlas Processing	Shreveport, La	.....	Benzene	Extractive distillation and solvent recovery plant on stream early '53.
Augusta Chemical	Augusta, Ga.	.....	Resorcinol	Scheduled to operate June '53. 1 million lb. per year. New process.
Belle Alkali	Belle, W. Va.	500,000	Methylene chloride	Certificate of necessity granted.
Celanese	Belvidere, N. J.	1,200,000	Formaldehyde	Certificate of necessity granted.
Celanese	Bishop, Tex.	.....	Normal butyl alcohol	On stream April '53.
Celanese	Dumas, Tex.	17,000,000	Acetic acid, acetic anhydride, methanol, acetone	Operations scheduled to begin late '52.
Celanese	Pampa, Tex.	.....	Vinyl acetate	Completed July '53. Over 30 million lb. per year. New process for monomer.
Celanese	Pampa, Tex.	.....	Propionic acid, butyric acid	Production begun June '53.
Commercial Solvents	Agnew, Calif.	.....	Pentaerythritol	Plans for expansion announced May '53. Expansion underway.
Commercial Solvents	Sterlington, La.	4,300,000	Methylamines	Certificate of necessity granted for expansion.
Delaware Chemicals	Newark, N. J.	1,000,000	Pentaerythritol	Plans announced March '53.
Diamond Alkali	Deer Park, Tex.	750,000	Perchlorethylene	Completed during '53.
Dow	Freeport, Tex.	8,000,000	Ethylene dibromide	New plant planned as of late '52.
Dow	Freeport, Tex.	.....	Perchloroethylene, carbon tetrachloride, hydrochloric acid	In operation Jan. '53.
Dow	Freeport, Tex.	5,500,000	Glycerol	Certificate of necessity granted.
Dow	Midland, Mich.	1,000,000	Bisphenol-A	Certificate of necessity granted.
Dow	Midland, Mich.	15,000,000	Vinyl toluene	Scheduled for completion end '53. Volume production early '54. May replace styrene in many uses.
Dow	Midland, Mich.	.....	Chloracetaldehyde	In commercial production Jan. '53.
Dow	Pittsburg, Calif.	1,500,000	Methionine	Under construction as of Oct. '53.
Dow	Torrance, Calif.	1,700,000	Styrene	Under construction as of Oct. '53.
Dow-Corning	Midland, Mich.	800,000	Methyl chloride	Nearing completion as of June '53.
Du Pont	Belle, W. Va.	4,000,000	Synthesis gas	Plans announced June '53 for replacement of facilities with more modern equipment.
Du Pont	Beaumont, Tex.	4,000,000	Methionine	Construction scheduled to start Aug. '53.
Du Pont	Deepwater, N. J.	.....	Isocyanate	On stream July '53.
Du Pont	Deepwater, N. J.	2,000,000	Freon	To start construction immediately (as of Oct. '53)
D. D. Feldman	Lake Arthur, La.	1,300,000	Benzene, toluene, xylene	Plans announced May '53.
Foster-Grant	Baton Rouge, La.	4,000,000	Styrene monomer	Under construction as of Oct. '53. May come in by end '53.
Galvatex Coatings	Anaheim, Calif.	500,000	Vinyl acetate	Expansion plans announced Aug. '53.
General Electric	Waterford, N. Y.	10,500,000	Methyl chloride	Certificate of necessity granted.

SYNTHETIC ORGANICS (Cont'd)

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Goodrich Chemical	Calvert City, Ky	8,500,000	Acrylonitrile	Under construction. To be completed fall '54 24 million lb. per year.
Goodrich Chemical	Calvert City, Ky	6,000,000	Vinyl chloride monomer	On stream Aug. '53.
Great Southern Chemicals	Corpus Christi, Tex		Benzene, toluene	Scheduled to operate Oct. '53.
Gulf Oil	Port Arthur, Tex	8,000,000	Ethylene	New plant on stream early '53. 180 million lb. per year.
Hercules	Burlington, N. J		Dimethyl isophthalate	Commercial production started Jan. '53. 200,000 lb. per month. New oxidation process.
Hercules	Mansfield, Mass		Pentaerythritol	Expansion from 18 to 24 million lb. per year. Scheduled to be complete by end '53.
Hercules	Paulsboro, N. J	8,500,000	Phenol	Scheduled to operate July '54. 26 million lb. per year.
Heyden & Monsanto	Texas City, Tex		Methanol	Scheduled to be in production by Jan. '55. 25,000,000 gallons per year.
Hooker-Detrex	Ashtabula, Ohio	1,000,000	Perchlorcethylene, anhydrous hydrochloric acid	Plans for expansion announced June '53. To operate by April '54.
Humble Oil & Refining	Baytown, Tex		Para-xylene	In operation Oct. '53. 25 million lb. per year.
Jefferson Chemical	Port Neches, Tex		Nonyl phenol	On stream Feb. '53.
Kolker Chemical	Newark, N. J		Methylene chloride, chloroform, tricresyl phosphate	About ready to begin operation (as of Sept. '53).
Koppers	Port Arthur, Tex		Ethyl benzene	In full production early '53. 90 million lb. per year.
Koppers	Kobuta, Pa		Butadiene	2 production lines reactivated early '53. From alcohol.
B. L. Lemke	Lodi, N. J		Para-aminobenzoic acid	Production quadrupled March '53.
Loven Chemical	Newhall, Calif	3,600,000	Phenol, formaldehyde	Construction to start early '54. 10 million lb. per year each.
Mathieson	Morgantown, W. Va		Hexamine	Started production Oct. '53.
Mathieson	Morgantown, W. Va		Caprolactam	Plans announced March '53. Will supply American Enka for nylon.
Monsanto		5,000,000	Phthalic anhydride	Under construction as of Oct. '53. Will double output to 50 million lb. per year.
Monsanto			Tricresylphosphate	Production changes completed as of Oct. '53 to boost capacity 80%.
Monsanto	Avon, Calif		Phenol	Initial test run made Oct. '53.
Monsanto	Everett, Mass		Dioctyl phthalate	New unit in production end '52.
Monsanto	Long Beach, Calif		Styrene	Under construction as of Oct. '53.
Monsanto	Monsanto, Ill		Phenol	Due in before end '53.
Monsanto	Texas City, Tex		Acrylonitrile	On stream late '52. 35,000,000 lb. per year.
Monsanto	Texas City, Tex	40,000,000	Vinyl chloride, ethylene dichloride	Plant addition in operation Jan. '53.
Monsanto	Texas City, Tex	3,500,000	Styrene	Addition to plant in operation during '53.
National Petrochemicals	Tuscola, Ill	44,000,000	Petrochemicals	First unit, which recovers liquid hydrocarbons from natural gas and separates them into ethane, propane, and butane in operation since July '53.
Oronite Chemical		Multi-million	Isophthalic acid	Announcement of construction plans awaiting site selection (as of Aug. '53). 50 million lb. per year.
Pacific Vegetable Oil	Richmond, Calif	250,000	Solvents	Plans for expansion announced May '53.
Thomas N. Peck & Associates	Eastern, Ky	500,000	Furfural	Certificate of necessity granted.
Phillips Chemical	Borger, Tex	1,500,000	Cyclohexane	In operation during '53.
Phillips Chemical	Port Adams, Tex	2,500,000	Synthetic pyridines	On stream Jan. '53. 2,000,000 lb. per year. Shut down.
Pittsburgh Coke & Chemical	Neville Island, Pa		Plasticizers	Expansion completed late '52. To more than 1,000,000 lb. per month.
Quaker Oats	Memphis, Tenn	600,000	Furfuryl alcohol	In operation Oct. '53.
Gustav T. Reich	Falling Creek, Va	200,000	Glycerine	Certificate of necessity granted.
Reichhold			Phenol	On stream Oct. '53. Boosted from 48 to 64 million lb. per year.
Reichhold	Seattle, Wash		Formaldehyde	New unit on stream Feb. '53. New process.
Reilly Tar & Chemical	Indianapolis, Ind		Synthetic pyridines	Ready to go on stream as of Feb. '53. 4,000,000 lb. per year.
Rohm & Haas	Deer Park, Tex	8,000,000	Acrylic monomer, acrylates	In operation Jan. '53. New process.
Shell Chemical	Houston, Tex	9,000,000	Synthetic glycerine	Certificate of necessity granted.
Shell Chemical		7,500,000	Isopropyl alcohol, acetone, methyl isobutyl ketone	Certificate of necessity granted.
Shell Chemical	Norco, La		Allyl chloride, epichlorhydrin	Plans announced Aug. '53. Will ship to Houston for making epoxy resins and glycerine. Will boost glycerine by 25 million lb. per year.
Shell Chemical	Houston, Tex		Epichlorhydrin	On stream March '53.
Shell Oil	Houston, Tex		Benzene, toluene	On stream March '53. 19 million gal. per year benzene, 33 ditto of toluene.
Sherwin-Williams	Chicago, Ill		Synthetic para-cresol	50% expansion being completed (as of Jan. '53).
Sherwood Chemical	Witchita, Kan		Aromatic solvents	Land purchased for blending plant April '53.
Spencer Chemical	Vicksburg, Miss	14,000,000	Petrochemicals	Completing as of Oct. '53.
Standard Oil (Calif.)	Richmond, Calif	4,000,000	Phenol	Scheduled on stream end Dec. '53.
Standard Oil (Calif.)	Richmond, Calif. & El Segundo, Calif.		Para-xylene	Expansion to 35 million lb. per year scheduled by early '54.
Standard Oil (Calif.)	El Segundo, Calif	10,000,000	Benzene	Almost completed as of Dec. '52.
Standard Oil (Calif.)	El Segundo, Calif		Cumene	Scheduled on stream Dec. '53.
Standard Oil (Ind.)	Whiting, Ind		Para-xylene	Scheduled for operation Jan. '55. 14 million lb. per year.



PYRIDENE—New plant of Phillips Chemical Co., near Houston, Tex. Petroleum raw materials, continuous process.

SYNTHETIC ORGANICS (Cont'd)

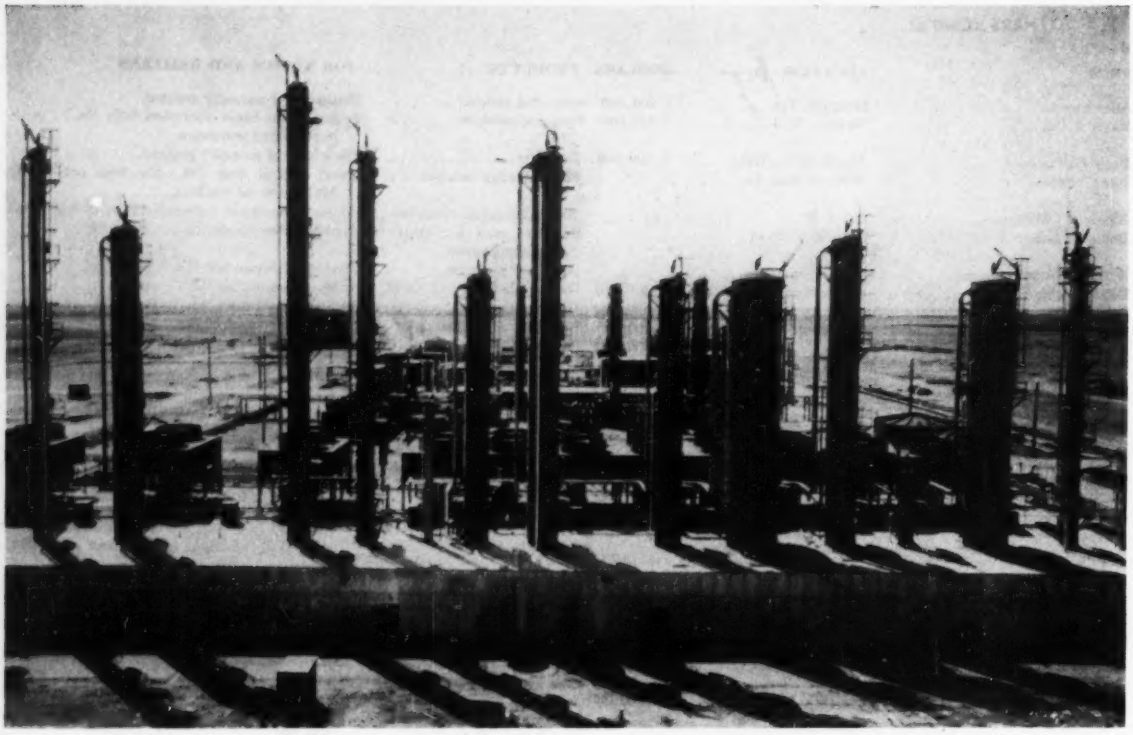
FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Standard Oil (N. J.)	Bayway, N. J	2,900,000	Methyl ethyl ketone	Certificate of necessity granted.
Stauffer	Louisville, Ky	2,100,000	Methylene chloride	Certificate of necessity granted.
Stratosphere Products	Salt Lake City, Utah		Antifreeze	Started production Aug. '53.
Tennessee Products & Chemical	Chattanooga, Tenn		Dipropylene glycol dibensoate	On stream May '53.
Tennessee Products & Chemical	Chattanooga, Tenn		Trichlorobenzene, insecticides	New facilities scheduled on stream spring '54 Part of $3,500,000 expansion program.
Thiochemicals, Inc	Port Arthur, Tex	500,000	Methyl mercaptan	Plans announced Sept. '53. Expect full-scale production in 2 years. From hydrogen sulfide.
Union Carbide (Carbide & Carbon)	Charleston, W. Va		Butyl chloride	Capacity tripled late '52.
Union Carbide (Carbide & Carbon)	Institute, W. Va		Acrylonitrile	Went on stream late '52. 35,000,000 lb. per year.
Union Carbide (Carbide & Carbon)	Institute, W. Va		Low-boiling phenols	First tank car shipment of products from $11,000,000 coal hydrogenation demonstration plant—Dec. '52.
Union Carbide	Louisville, Ky		Butadiene	Two production lines reactivated early '53. From alcohol.
Warren Petroleum	Houston, Tex	1,500,000	Pentaerythritol, other LPG oxidation products	In planning stage as of June '53. 2.5 million lb. per year PE, 4 ditto methanol, 2 ditto acetaldehyde.

OTHERS

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Air Reduction	Calvert City, Ky		Calcium carbide	To double capacity as of Jan. '53.
Alcoa	Alcoa, Tenn	2,500,000	Cryolite	Certificate of necessity granted.
Alcoa	Rockdale, Tex		Dried lignite	Completion of construction due end '53.
Allied Chemical & Dye	Port Chicago, Calif		Aluminum fluoride	New plant on stream Jan. '53.
Allied Chemical & Dye	Savannah, Ga	200,000	Liquid alum	Completed as of April '53. Further expansion planned.
Allied Chemical & Dye	Solvay, N. Y	2,000,000	Potassium carbonate	Scheduled for completion spring '54.
Aluminum Ore	Bauxite, Ark	5,000,000	Alumina, aluminum	Will construct new plant (as of Dec. '52).
Aluminum Ore	E. St. Louis, Ill	200,000	Synthetic cryolite	Certificate of necessity granted.
American Bitumuls & Asphalt	Miami Ford, Ohio	4,000,000	Asphalt	Refinery planned (as of Aug. '53). Tract acquired. Will process crude asphalt from Venezuela.
Anderson Laboratories	Weston, Mich		Organo-metallics, trimethyl and tributyl borates, 4, 7-dichloroquinoline	Facilities expanded at new plant location (as of Jan. '53).
Archer-Daniels-Midland	Ashtabula, Ohio	8,000,000	Fatty alcohols	Scheduled to operate late '54. Convert linseed, soy bean, and marine oils.
Arnold, Hoffman	Cincinnati, Ohio		Fatty acids and derivatives	Completed (as of late '52). New molecular still and esterification unit.

OTHERS (Cont'd)

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Atlas Powder	Marshall, Tex.	3,600,000	Activated carbon	Certificate of necessity granted.
Baker & Co.	Newark, N. J.	2,500,000	Platinum catalyst	Scheduled to begin operation early '54. For use in reforming petroleum.
Basic Refractories	Maple Grove, Ohio	3,500,000	Dolomite	Certificate of necessity granted.
Bay Chemical	Weeks Island, La.		Silica alumina catalyst	Plant opened Aug. '53. 450 tons per month. Major use: oil cracking.
Blockson Chemical	Joliet, Ill.		Heavy industrial chemicals	Major expansion of current facilities contemplated.
Bonewitz Laboratories	Burlington, Iowa		Sodium and ammonium phenolsulfonates	New facilities completed (as of late '52.)
Buffalo Electro-Chemical	Vancouver, Wash.		Hydrogen peroxide	Production began late '52.
Cabot Carbon	Bayou Sale, La.	400,000	Carbon black	In operation during '53.
Cabot Carbon	St. Mary Parish, La.	1,800,000	Carbon black	In operation during '53.
Calaveras Cement	San Andreas, Calif.	2,500,000	Cement	Capacity increased 50 percent late '52.
Camp Manufacturing	Franklin, Va.	300,000	Semi-hardboard	Certificate of necessity granted. To use waste wood.
Catus Chemical			Liquid fatty acids and pure rosins	First carload shipped June '53. 1,000 lb. per hr. fatty acids, 750,000 lb. per month pure rosins.
Chemical Lime	Baker, Ore.		Chemical-grade lime	Scheduled to start production soon (as of Sept. '53). 66,000 tons per year.
Continental Black	Ponca City, Okla.	2,750,000	High-abrasion carbon black	Due in mid '54. 40 million lb. per year.
Continental Carbon	Sunray, Tex.	200,000	Carbon black	In operation during '53.
Crossett Chemical	Crossett, Ark.		Tall oil (whole)	Operations began Jan. '53. Rated capacity: 24,000 tons per year.
Davison	Lake Charles, La.		Sodium silicate	Announced Jan. '53. To make 300 tons per day solid and solution forms. New continuous process.
Davison	Lake Charles, La.	7,000,000	Cracking catalyst	Plant dedicated early '53. 44,600,000 lb. per year.
Dearborn Chemical	Lake Zurich, Ill.		Water-treating chemicals	First unit scheduled for operation Nov. '53.
Diamond Alkali	Dallas, Tex.	400,000	Sodium silicate	Completed during '53.
Dow	Near Denver, Colo.	43,000,000	Atomic materials	Started operation during '53.
Du Pont	Memphis, Tenn.		Hydrogen peroxide	In operation Aug. '53. Using new non-electrolytic process.
Du Pont	Lawtey, Fla.	3,000,000	Ilmenite	To operate early '55. 100,000 tons per year.
Eastman Kodak	Rochester, N. Y.		Mono-methyl-para-amino-phenol sulfate	New and enlarged production facilities completed late '52.
Emery Industries	Cincinnati, Ohio		Dimer acid	Expanded production scheduled for Dec. '53.
Farm & Industrial Chemical	Atlanta, Ga.	150,000	Bleach	New plant on stream late '52. 16,000 gallons liquid bleach per day.
Filtrol	Salt Lake City, Utah	100,000	Clay catalysts	Certificate of necessity granted.
Foote Mineral	Sunbright, Va.		Lithium hydroxide	Working towards full production (as of Sept. '53). To double world supply of lithium. Chemical separation from spodumene.
Galesburg Soy Products	Galesburg, Ill.	500,000	Soybean oil	RFC loan obtained to install solvent extraction equipment late '52.
Gane & Ingram	New York, N. Y.		Desoxycholic acid	Second expansion completed Feb. '53.
Girdler	Louisville, Ky.		Activated carbon	In operation late '52. New continuous process.
Glyco Products	Williamsport, Pa.		Ethylenediamine tetracetic acid and salts	Full scale production started Sept. '53.
Goodrich Chemical			Sodium polyacrylate	Expansion completed late '52.
Goodyear Tire and Rubber	Akron, Ohio	1,500,000	Synthetic-rubber chemicals	Expansion announced May '53.
Goodyear Tire & Rubber	Niagara Falls, N. Y.	4,000,000	Rubber accelerators and anti-oxidants	Construction scheduled to start summer '53.
Grand Central Aircraft	Pacoima, Calif.		Propellants	Operating (as of Jan. '53).
Great Lakes Carbon (Dicalite)	Lompoc, Calif.		Diatomaceous earth	Plant completed during '53.
Great Western Sugar	Johnstown, Colo.	25,000,000	Monosodium glutamate	Completion scheduled for Nov. '54. From sugar beet residues.
Hercules	Hopewell, Va.	250,000	Special chemicals for military	Certificate of necessity granted.
Hoberg Paper Mills	Green Bay, Wisc.	2,500,000	Torula yeast	Construction to start soon (as of Jan. '53). To use sulfite waste from pulp mill.
R. M. Hollingshead	Camden, N. J.	350,000	Military chemicals	Certificate of necessity granted.
Houdry Process	Paulsboro, N. J.		Petroleum catalyst	New plant to make catalyst for Houdriforming operations (as of late '52).
International Minerals & Chemical	Carlsbad, N. M.		Magnesium oxides, hydrochloric acid	New plant on stream May '53. New process uses byproduct liquors from potassium sulfate plant.
International Minerals & Chemical	Janesville, Wisc.		Refractories	Construction started May '53. 75,000 tons per year.
International Minerals & Chemical	San Jose, Calif.	1,500,000	Monosodium glutamate	Expansion completed Aug. '53. Capacity doubled.
Kaiser Aluminum & Chemical	Fallon, N. M.	400,000	Fluorspar	On stream during '53.
Keystone Chemical	Houston, Tex.	100,000	Sodium acid tannate	Certificate of necessity granted.
Lea Manufacturing	Waterbury, Conn.	250,000	Abrasives	Certificate of necessity granted.
Lindsay Chemical	W. Chicago, Ill.		Rare earth chemicals	Expansion planned (as of Jan. '53).
Lone Star Cement	Sweetwater, Tex.	13,000,000	Cement	Planned (as of late '52). To double capacity to 1,125,000 bbl. per year.
Marathon	Rothschild, Wisc.	500,000	Lignin derivatives	Expansion completed Jan. '53. Capacity of lignosulfonate powders now 4,250,000 lb. per month, plus 3,000,000 lb. solids per month in liquid products.
Matholin	Lake Charles, La.	3,000,000	Hydrazine	Production started July '53. Mathieson and Olin Industries. Counting on commercial uses as well as rocket fuel.
Metal Hydrides	Beverly, Mass.	1,000,000	Metallic hydrides	Certificate of necessity granted.
Metalsalts			Procaine hydrochloride	In full scale production April '53.
Midwest Carbide	Pryor, Okla.	3,000,000	Calcium carbide	Scheduled for operation mid-'54.



ORGANIC CHEMICALS—New plant of Celanese Corp., Pampa, Tex. Based on catalytic air oxidation of butane.

OTHERS (Cont'd)

FIRM	LOCATION	DOLLARS	PRODUCTS	JOB STATUS AND REMARKS
Mississippi Cottonseed Products	Greenwood, Miss.	.....	Cottonseed and soybean oil	Scheduled to operate by June '53. 150 tons cottonseed or 75 tons soybeans daily.
Monsanto	Everett, Mass.	.....	Sodium bisulfite	Plans for 50% expansion announced May '53.
National Aluminate	South Gate, Calif.	Several million	Microspheroidal cracking catalyst	Full-scale production due by Jan. '54.
National Gypsum	.....	3-5,000,000	Gypsum board and plaster	In planning stage as of June '53.
National Lead	Edson, Kan.	.....	Diatomaceous earth	Scheduled for completion April '53. Double capacity.
New Jersey Zinc	Jefferson City, Tenn.	.....	Zinc sulfide ore	1,000 tons per day mill scheduled for construction (as of Aug. '53).
Newport Industries	Bay Minette, Ala.	3,000,000	Tall oil	Construction to be completed spring '54.
Novadel-Agene	Geneseo, N. Y.	.....	Chemicals	Purchased land. Will start construction as soon as possible (as of Oct. '53).
Oldbury Electrochemical	Columbus, Miss.	3,500,000	Sodium chlorate	Scheduled for full production by April '54. Under construction. 25,000,000 lb. per year.
Pedlow-Nease	Lockhaven, Pa.	.....	Sodium methylate solutions	In production Oct. '53.
Pennsalt	Tacoma, Wash.	700,000	Sodium chlorate	Expansion underway as of Oct. '53.
Phillips Chemical	Borger, Tex.	2,000,000	Carbon black	Certificate of necessity granted.
Phillips Chemical (Gov't. contract)	Etter, Tex.	1,800,000	Nitric acid	Expansion by 110 tons per day completed. Formerly Cactus Ordnance Works.
Procter & Gamble	Sacramento, Calif.	2,500,000	Synthetic detergents	Operations started Jan. '53.
Robinson-Wagner	Mamaroneck, N. Y.	200,000	Chemicals	Expanded facilities for esterification, vacuum distillation, condensation scheduled for completion May '53.
St. Lawrence Fluorspar	Wilmington, Del.	1,300,000	Acid-grade fluorspar	Certificate of necessity granted.
Standard Chemical Products	Charlotte, N. C.	750,000	Textile chemicals	In planning stage as of July '53.
Stauffer	Saico, Ala.	1,000,000	Carbon bisulfide	Scheduled on stream Dec. '53.
Stauffer	Henderson, Nev.	.....	Muriatic acid	Will supplement byproduct muriatic with synthetic (as of May '53).
Stepan Chemical	Chicago, Ill.	100,000	Fatty alcohol sulfates	Started up March '53. 1,500,000 lb. per year. New process uses tallow raw material.
Tennessee Corp.	E. Point, Ga.	750,000	Manganese sulfate, other manganese chemicals	Ore reduction plans announced Jan. '53.
U. S. Gov't. (A.E.C.)	Macomb, Ill.	29,000,000	Explosives	To be completed mid '54.
United Feldspar & Minerals	.....	.....	Pyrophyllite	Plans announced April '53.
Western Electrochemical (Gov't. contract)	Henderson, Nev.	.....	Ammonium perchlorate	New plant started up early '53.
Western Electrochemical	Henderson, Nev.	.....	Sodium chlorate	Major expansion in chlorates and perchlorates.
Western Safflower	Colorado Springs, Colo.	250,000	Safflower oil	Scheduled to be in initial production Sept. '53. Eventual production: 400 tons per day.
Wica Chemicals	Charlotte, N. C.	.....	Specialty chemical	Recently formed to manufacture chemicals.

New Processes and Technology, 1952-53

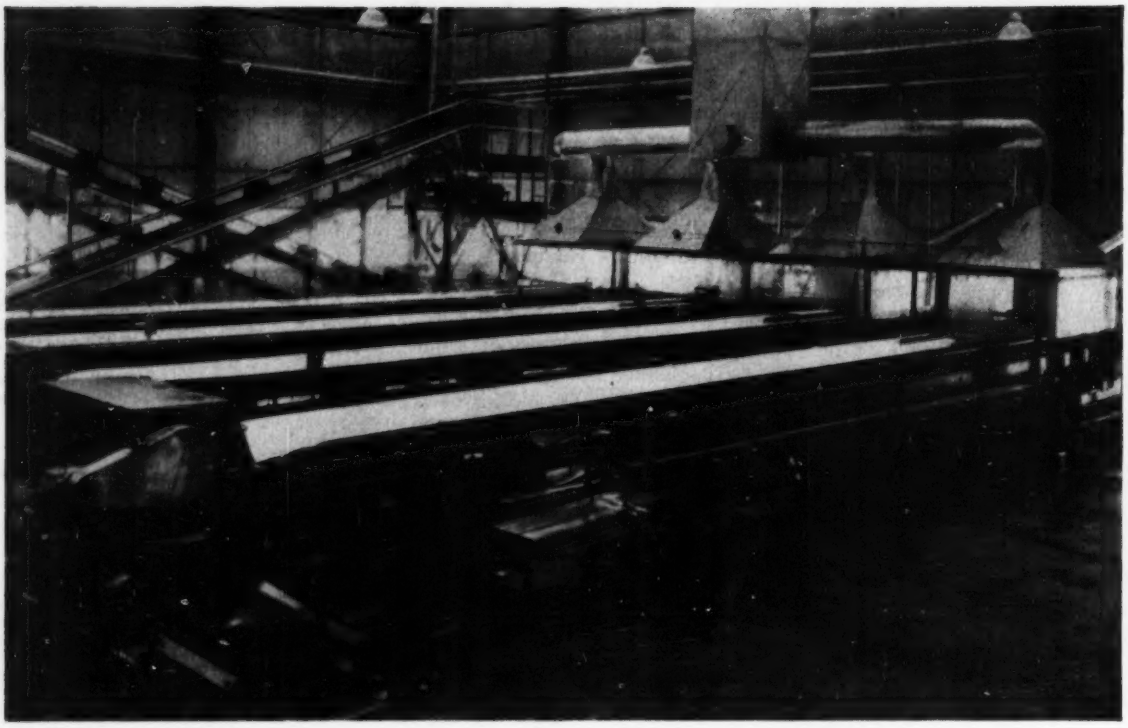
Here's a rundown on the 340 most important chemical process and engineering developments which were announced or commercialized during the past two years.

FATS AND OILS

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Fats and oils	Impulse rendering	W. Harris, Ltd. Toronto, Ont.	Renders oils and fats from bones, etc., suspended in water, by high-frequency mechanical impulse of modified hammer mill.	Inventor, I. H. Chayen, British Glues & Chemicals, Ltd., claims process is faster, gives better product, than present heat methods. Available in U. S. through Sharples Corp.
Fatty alcohols	Sodium reduction	Stepan Chemical Co. Chicago, Ill.	Tallow, methyl sobutyl carbinol and toluene react with dispersion of sodium in toluene to release glycerine. Solvents are recovered, fatty alcohol mixture purified by distillation.	1.5-million lb./yr. semiworks started early 1953, giving 85–90 percent yields
Fats, animal	Rapid heating	Kingam & Co. Indianapolis, Ind.	Fatty tissue is ground to fluid mass, pumped through continuous heat exchanger to rupture, then centrifuged. Cuts processing time to 15 sec.; other savings.	Demonstrated on full scale. Company plans to market packaged plants.
Fat splitting	Packaged plant	.....	Makes modern continuous fat splitting practical for small producers.	Offered by Blaw-Knox Co.
Fish oils	Vacuum polymerization	.....	Fish oils, following pretreatment, are treated under vacuum at 200–250 deg. C. with wet steam which superheats during process to give special effect.	Process developed in Germany by Bamag Meguin A. G., available in U. S. from General Industrial Development Corp.
Higher alcohols	Sodium reduction	Archer-Daniels-Midland Ashtabula, Ohio	Will process linseed, soybean and marine oils by improved sodium reduction process to produce higher alcohols of high purity.	Plant operation scheduled for June 1954
Hydroxylated fats	Peracetic oxidation	Baker Castor Oil Co. Bayonne, N. J.	Cheap vegetable oils or animal fats are esterified, then oxidized with peracetic acid. Initial products are vinyl resin plasticizers.	Developed by USDA. Plant in commercial operation. Two other companies have also been licensed to use the process.
Lard	Reforming	Armour & Co. Fort Worth, Tex.	Reforming with heat using sodium methoxide catalyst makes product similar to vegetable shortening.	Present output solely for bakeries.
Margarine	Compounding	Armed forces	Saturated monoglycerides are melted with vegetable oils and quickly chilled. Mixture can be spread at −4 deg. F., retains its form at 110 deg. F.	Developed by USDA.
Peanut meal	Solvent extraction	British Extracting Co. Bromborough, England	Extraction is done at room temperature instead of usual 40 deg. C., and desolventizing is done under vacuum. Purpose is to avoid thermal degradation of meal.	Plant is turning out 100 tons/day of meal. Product goes to ICI to make Ardil protein fiber.
Soybean meal	Solvent extraction	Central Soya Co. Fort Wayne, Ind.	Solvent-extracted seeds are cooked to remove solvent rapidly, causing cell walls to explode and free protein for ready digestion.	In operation. Claimed to give meal of better taste, high thiamin content
Vegetable oils	De Smet	Various	Prepared seed is fed onto horizontal moving screen, with solvent sprayed onto moving bed from above in countercurrent scheme. Oil is recovered from solvent in falling-film evaporator and vacuum stripping column.	Developed in Belgium. Available in U. S. through Stockdale Engineering Co., Philadelphia.
Vegetable oils	Filtration-extraction	Miss. Cottonseed Products Greenwood, Miss., others	98 percent yield, high-grade meal. Small user can convert to solvent extraction without prepressing. Horizontal rotary filter is main unit.	150 ton/day plant in operation. Process developed by USDA, offered by several process engineering firms.

TEXTILE FIBERS

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Cotton, modified	Chemical treatment	.....	Structurally different fiber is made by treatment of ordinary cotton fiber, yarn or fabric with acrylonitrile.	Developed by Inst. of Textile Technology.
Dynel	Dope dyeing	Carbide and Carbon Chemicals	Fiber has color in it as spun. First fiber besides acetate dyed this way.	In operation.
Glass fibers	Sizing	.....	Vinyl chlorosilane sizing of fibers improves bonding of plastics to the glass.	Developed by Bjorksten Research Lab.
Mineral fabric, nonwoven	Felting	.....	Alumina-silica fibers 1 x 25 microns are felted on fourdrinier machine.	Developed by Naval Research Lab.
Nylon	Helanca	Duplan Corp.	Fibers are twisted and heat set to give stretch five times normal length.	Patented Swiss process.



AMMONIUM NITRATE—Continuous process reacts ammonia and nitric acid directly, cools product on Sandvik belts.

TEXTILE FIBERS (Cont'd)

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Plastic fabrics	Fusion		Plastics such as Kel-F, nylon, Dacron, polyethylene are melted, sprayed with hot gas onto moving screen, later stripped as nonwoven fabric of submicron filaments.	Developed by Naval Research Lab. for electrical fabrics, possibly protective clothing. Expect operating costs to be few cents/lb.
Polyamide fiber		Allied Chemical & Dye Hopewell, Va.	Company will make 20 million lb./yr. of a nylon-type fiber based on caprolactam. This raw material is made from phenol, NH_4, H_2, sulfuric.	Process to be ready about end of 1954.
Rayon staple	Spin dyeing	Courtaulds, Inc. Mobile, Ala.	First U. S. production of spun-dyed staple being made in ten colors. Made by incorporating dye in viscose.	Developed by Courtaulds, Ltd., in England.

FERTILIZERS AND FERTILIZER CHEMICALS

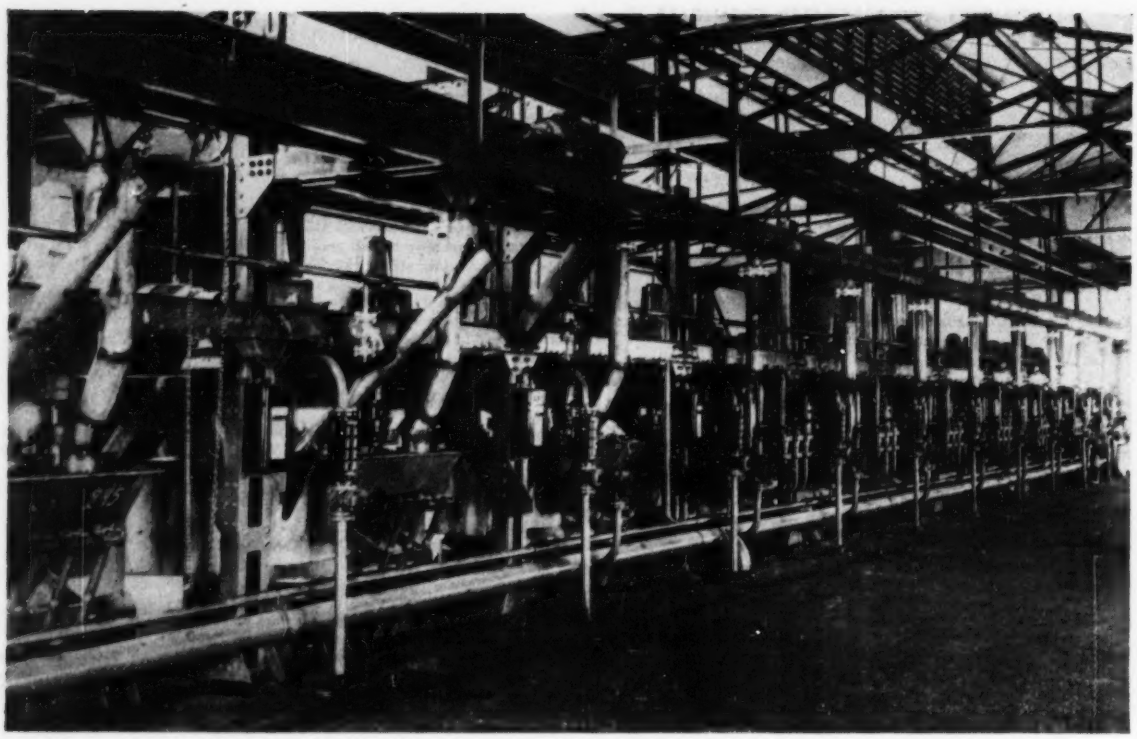
PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Ammonia	Casale	Pennsylvania Salt Mfg. Co. Wyandotte, Mich.	Combines hydrogen from electrolytic chlorine with nitrogen from air separation.	Developed in Italy.
Ammonia	Partial oxidation	Spencer Chemical Co. Vicksburg, Miss.	Synthesis by partial oxidation of natural gas, cost reduced 6 percent.	First commercial plant to use this process; several more underway.
Ammonia	Pressure reforming	Shell Chemical Corp. Ventura, Calif.	Natural gas, available under pressure, is reformed under pressure, saving 25-35 percent in compressor horsepower.	New 150 ton/day plant completed late 1953. Engineered by M. W. Kellogg Co.
Ammonia	Synthesis gas purification		Process scrubs synthesis gas with liquid nitrogen at -290 to -310 deg. F. to remove methane and carbon dioxide.	Developed by German Linde Co. Offered in U. S. by Blaw-Knox Co.
Ammonium nitrate	Continuous (Stengel)	Commercial Solvents Corp Sterlington, La.	Ammonia and nitric acid react directly at 400 deg. F. to yield molten nitrate, which is cooled on Sandvik belts, then crushed. Eliminates evaporation and graining or prilling.	200 ton/day plant in operation.
Fertilizer, complete	Nitric acidulation	Allied Chemical & Dye S. Point, Ohio	Ground phosphate continuously acidulated with nitric and a little sulfuric, then neutralized with ammonia. Potash salts are added and product is granulated.	Process expected to save up to 88,000 tons/yr. of sufuric. Product contains NPK in 12-12-12 ratio. Plant is in operation.

FERTILIZERS AND FERTILIZER CHEMICALS (Cont'd)

PRODUCT	PROCESS	USER AND LOCATION	PRODUCTS	STATUS AND REMARKS
Fertilizer, mixed	Automatic	Naco Fertilizer Co. Ft. Pierce, Fla.	Complex, varied formulas are batched by automatic scales and conveyors.	Plant in operation.
Fertilizer, mixed	Granulation	Eastern States Farmers' Exchange Wilmington, Del.	Rotary dryer modified to serve also as granulator by removing flights from feed end. Pug mill serves as feeder. Product is uniform size, homogeneous.	Plant capacity 15 tons/hr.
Fertilizer, nitrophosphate	Calcium nitrate conversion	Gewerkschaft Victor Castrop-Rauxel, Germany	Addition of small quantities of metallic salts such as Mg or Al permits high pH of ammoniated nitric-acidulated phosphate. This alkaline slurry can be treated with CO_2 to convert hygroscopic calcium nitrate to carbonate.	Process developed in France by Potasse et Engrais Chemique. Offered in U. S. as successful solution to nitric acidulation problem by Chemical & Industrial Corp., Cincinnati.
Fertilizer, nitrophosphate	High-strength nitric acidulation	Lonza Electric & Chemical Works Basle, Switzerland	Phosphate is acidulated with 68–75 percent nitric acid instead of usual 50 percent; no drying is required. Granulated product is powdered with hydrated lime and can be stored without caking.	Avoids need for ammoniation to overcome hygroscopicity of calcium nitrate.
Fertilizer, phosphate	Continuous	Stauffer Chemical Co. Tacoma, Wash.	Produces pelleted material, eliminates aging, uses standard raw materials.	Developed in Italy. Plans announced for commercial plant to make 25,000 tons/yr.
Fertilizer, phosphate	Fusion		Phosphate rock fused with magnesium and potassium sulfates gives better than 95 percent P_2O_5 availability.	Pilot plant at Iowa State College.
Fertilizers, various	CO_2 blasting		Heaving action of expanding CO_2 released from a steel tube breaks up solidified storage piles. Safer than using dynamite.	Developed by Cardox Corp., Chicago.
Superphosphate	Ammoniation	Tennessee Valley Authority Wilson Dam, Ala.	Continuous ammoniator for superphosphates employs a rotating cylinder.	Pilot plant in operation.
Superphosphate, ammoniated	"Surfactant"	Illinois Farm Supply Co. E. St. Louis, Ill.	Ammoniation aging step speeded up ten times by mixing 0.05 percent of surface-active agent Santomerse 1 with super and ammoniating agent.	Process available to industry. Costs about 15c./ton treated. Improves flow and storage qualities of fertilizer.

INORGANICS

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Alumina	Electrolytic		Continuous electrolytic process is claimed to produce high-purity alumina from low-grade kaolin clays containing as little as 6 to 10 percent alumina. Power consumption less than 2 kwh./lb.	Developed in Europe. Process available in U. S. through Lobeth Corp., Chicago.
Alumina	From anorthosite	U. S. Bureau of Mines Laramie, Wyo.	Anorthosite (aluminum silicate) is sintered with limestone to yield alumina and portland cement base.	Experimental plant in operation.
Aluminum silicate fiber	Electric furnace	Carborundum Co. Niagara Falls, N. Y.	50–50 silica-alumina melt in arc-resistance furnace at 3,300 deg. F. is blown by high-velocity air.	Fluffy, fibrous mass resists temperatures to 2,300 deg. F. Used also for electrical insulation and filtering.
Bauxite ore	Beneficiation		Makes high-iron fraction of domestic ore usable for alumina production.	Developed by U. S. Bureau of Mines.
Calcium carbide	Electrothermic	National Carbide Co. Calvert City, Ky.	Two 24,000-kw. carbide furnaces use rotating hearths. Slow rotation, 50–100 hr./rev., counteracts crater formation, keeps charge porous.	Designed by Elektrokemisk A. S. of Oslo. Another rotating furnace ordered by Maria Cristina Industries, Inc., Philippine Islands.
Carbon, activated	Continuous	Girdler Corp. Louisville, Ky.	Continuous process replaces older batch process, producing a more uniform product.	Plant in operation.
Carbon disulfide	Electrothermal	J. T. Baker Chemical Co. Penn Yan, N. Y.	Process uses sulfur and charcoal.	First commercial plant using this process.
Caustic-chlorine	Electrolytic	Monsanto Chemical Co. (for Army) Muscle Shoals, Ala.	De Nora electrolytic cells have mercury cathodes which remove sodium as amalgam.	Operations have been suspended and plant offered for lease.
Caustic-chlorine	Electrolytic		Four-layer mercury cell features novel space-saving construction, saving estimated 75 percent of floor area. Expected to cut voltage losses, resulting in less than 3,100 kwh./ton chlorine in 30,000-amp. cell.	Mercury requirements reduced to 1,600–1,800 lb./daily ton of chlorine. Developed by A. S. White, Chicago.
Caustic soda	Electrolytic recovery	Ashland Oil & Refining Co. Ashland, Ky.	Spent caustic from gasoline sweetening, containing mercaptans, is regenerated by nascent oxygen at low cost in special electrolytic cells of plate type. Reduces capital and operating costs compared with conventional steam process.	Saves about $29 in operating cost and tetraethyl lead per M gal. gasoline. Developed by American Development Co., New York.
Cement, portland	Viscosity control	Missouri Portland Cement St. Louis, Mo.	0.15 percent sodium tripolyphosphate deflocculates shale slurry, cuts water content, makes slurry pumpable. Also increases plant output and saves fuel.	Used in 2,300 bbl./day operation.
Cement, portland	Naphtha slurry		High-boiling naphthas used instead of water in conventional wet process. Reduces fuel needs, other advantages.	Developed in Sinclair Oil Corp. laboratories. Ready for commercialization.



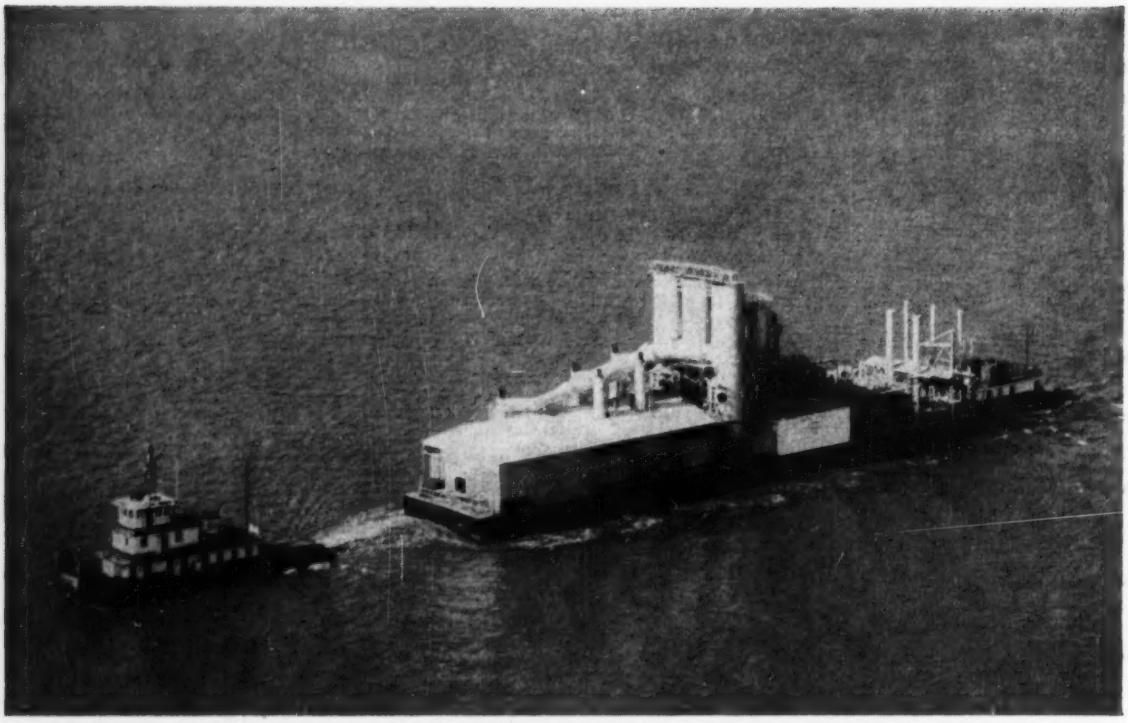
NITROPHOSPHATE FERTILIZER—French PEC process treats nitric-acidulated phosphate with ammonia and CO_2.

INORGANICS (Cont'd)

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Ceramic coating	Solaramic	Solar Aircraft Co. San Diego, Calif.	Process applies sprayed-on ceramic coatings to jet-engine parts, permits use of leaner alloys, saves nickel. Requires only one coat, fired at 1,700 deg. F.	In operation. Said to be first conveyorized, mass-production facility of its kind.
Ceramic papers	Conventional		Papers made from fused quarts and ceramic fibers by conventional beating and paper machine withstand temperatures to 3,000 deg. F.	Developed by Naval Research Lab. Made from plentiful domestic materials. Suitable for high-temperature electrical insulation, including nuclear power.
Chlorine dioxide	From sodium chlorate	Riegel-Carolina Corp. Acme, N. C.	Sodium chlorate is reduced in acid solution. Process is efficient, safe and economical.	Developed by Solvay Process Div., now in commercial operation.
Chlorine dioxide	SO_2 reduction	Pennsylvania Salt Mfg. Co.	Produced by reducing sodium chlorate with sulfur dioxide. Acid use is low, chlorate efficiency high, control easy.	Experimental.
Concrete	Compounding		Incorporation of polyvinyl acetate triples tensile strength.	MIT development.
Dicalcium phosphate	Acid extraction	Texas City Chemicals, Inc. Texas City, Tex.	Process uses spent rather than concentrated sulfuric. Treats phosphate rock with weak acid, recovers uranium, neutralizes with lime.	Weak acid supplied by Carbide & Carbon. Process developed by Chemical Construction. Plant in operation.
Dolomite	Heavy-media separation	Kaiser Aluminum & Chemical Corp. Natividad, Calif.	Sink-float unit upgrades dolomite by reducing its silica content. Heavy medium is ferrosilicon-magnetite.	200 ton/hr. plant in operation.
Enamel coating	Continuous	Barrows Porcelain Enamel Cincinnati, Ohio	Dried enamel slip is continuously fused on pipe without handling marks.	Production is 1,800 ft. of pipe per shift.
Fritted trace elements	Fusion	Ferro Corp. Cleveland, Ohio	Produces slowly soluble "glass" frit containing trace elements: Mn, Fe, Zn, Cu, B, Mo, for use as soil additive.	Claimed to leach slowly and give full year's supply of trace elements to supplement usual fertilizers.
Glass	Electric furnace	Northwestern Glass Co. Seattle, Wash.	Produces flint and amber glasses by electric resistance of molten glass batch. Uses molybdenum electrodes.	Trial operations underway.
Glass paper	Conventional		Glass fibers mixed in beater with 99 percent water are sheeted on conventional paper machine. Adding suitable binders to increase strength is eventual aim.	Developed by National Bureau of Standards and Naval Research Lab. for air filters and electrical insulation.
Hydrazine	Electrolytic		Electrolytic process uses high-frequency current on ammonia, getting 4–6 grams water-free hydrazine directly per kwh., bypassing hydrazine hydrate.	Process only bench scale so far. Developed at Univ. of Utah.

INORGANICS (Cont'd)

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Hydrazine	Modified Raschig	Matholin Corp., Lake Charles, La.	Sodium hypochlorite and NH_3 react to form chloramine, which reacts with more NH_3 to form hydrazine. Dilute solution (2 percent) is concentrated by azeotropic distillation.	$3-million plant in operation, first large-scale installation in U. S. Owned jointly by Mathieson Chemical and Olin Industries.
Hydrogen peroxide	Nonelectrolytic	E. I. du Pont de Nemours, Memphis, Tenn.	Alkylated anthraquinones are reduced, then oxidized with oxygen; peroxide is separated by solvent extraction.	First plant based on this process now in commercial operation. Buffalo Electro-Chemical Co. is pilot-planting similar process, others such as Penn Salt and Mathieson are considering.
Light-weight aggregate	High-temperature spherulizing	Kanium Corp., Chicago, Ill.	Vertical down-fired furnace operated on city gas at 2,700 deg. F. produces tiny hollow ceramic bubbles from clay particles introduced with combustion air.	Process developed by Armour Research Foundation.
Light-weight aggregate	Hot expansion	.....	Slag from electric phosphorus furnace is expanded while hot into a spongy mass, then cooled and crushed.	Developed by TVA, being tested commercially.
Magnesium oxide	Byproduct	International Minerals & Chemical Corp., Carlsbad, N. M.	Waste liquors from potassium sulfate production are thermally decomposed to produce various magnesium oxides and HCl.	$2.5-million plant, now operating, is integrated with Carlsbad refinery.
Manganese dioxide	Chemical refining	Utah Construction Co. & Associates, Utah (projected)	Ore concentrate leached with sulfur dioxide, then oxidized at high temperature and pressure. Manganous sulfate is sintered to produce oxide, drive off SO_2.	Developed by Chemical Construction Corp. Independent tests show 90–95 percent recovery.
Manganese dioxide	Electrolytic	Western Electrochemical Co., Henderson, Nev.	Ore leached with sulfuric, solution purified with barium sulfide and aeration. New cells feature low current density and labor requirement.	10 ton/day plant now in operation.
Mica	Sheeting	General Electric Co., others, Coshocton, Ohio	Domestic mica flakes are treated to be self-bonding for continuous sheet formation as in papermaking.	In commercial production. Also Samica Corp., Integrated Mica, with processes varying in certain respects.
Ore beneficiation	Electrostatic (?)	International Minerals & Chemical Corp., Florida (pilot plant); Carlsbad, N. M.	Ore is ground, dried, treated simply (how?), passed between separating electrodes. Can be used on potash ores, phosphate, others.	In pilot plant on Carlsbad, N. M., potash ores. Called LeBaron-Lawver process. Patents not yet issued. Larger plant scheduled for Carlsbad.
Oxygen	Fractionation	U. S. Navy, Aboard aircraft carriers	Liquid air fractionation column has baffles to reduce effect of motion on liquid levels.	Meets oxygen demands for jet pilots.
Oxygen	Low pressure	U. S. Air Force	Portable generator for 95–99.6 percent oxygen can be transported by air and set up in 80 hr. Uses reversing exchangers and turbo-expander.	Developed for Air Force by Arthur D. Little, Inc. Maximum pressure is 91 psig. Expected to produce 1.91 lb. liquid oxygen per lb. fuel.
Ozone	Electric discharge	Emery Industries, Inc., Cincinnati, Ohio	New discharge process is 10 percent efficient.	Welsbach Corp. and Emery collaborated on development.
Phosphoric acid	Vacuum concentration	Western Phosphates, Inc., Garfield, Utah	Acid will be concentrated in falling-film evaporator at vacuum of about 10 mm. Hg.	Plant under construction. Concentrator developed by Carrier Corp. (See Miscellaneous Technology.)
Rare earths	Countercurrent extraction	Oak Ridge National Laboratory, Oak Ridge, Tenn.	Glass countercurrent extraction column handles sufficient throughput for production of appreciable quantities of lanthanide rare earths.	Project well along.
Salt	Drying	Carey Salt Co., Hutchinson, Kan.	Salt is dried at 5 tons/hr. from initial 3 percent to 0.03 percent moisture in fluidized bed by hot gas from burning natural gas. Fluidized cooling follows.	Dryer developed by Combustion Engineering. Report fuel cost saving of two-thirds compared with kiln drying. Labor is reduced, power no higher.
Salt	Vacuum crystallizer	International Salt Co., Watkins Glen, N. Y.	Process recycles hot mother liquor to dissolve new salt, produces crystals by flash cooling. Can be single or double effect, can use vapor compression if desired.	Operated in 25 ton/day pilot plant. Investment is 60 percent and steam consumption about 55 percent of conventional process. Has no heat exchange surfaces, hence no scaling.
Silica	$SiCl_4$ combustion	Dow-Corning Corp., Midland, Mich.	Dow-Corning will produce fine silica powders in 4–25 millimicron range by German Degussa process, burning vaporized $SiCl_4$ and hydrogen in air.	Dow to make 30 tons/month. Godfrey L. Cabot likely to build similar plant.
Silicon chlorides	Catalytic	.....	Chlorine and silicon react with a catalyst fast enough, below ignition temperature, to form higher chlorides (e.g., hexachloride), depress tetrachloride formation.	Developed by National Research Council of Canada. Available through Canadian Patents & Development Ltd.
Soda ash	From trona	Intermountain Chemical Co., Westvaco, Wyo.	Solid trona is mined underground, brought to surface, processed to soda ash by crushing, dissolving, removing impurities, evaporating, crystallizing, centrifuging and calcining.	$18-million plant in operation. Capacity 300,000 tons/yr.
Soda ash	Wet handling	Union Bag & Paper Corp., Savannah, Ga.	Bulk soda ash is handled and stored as a solution or slurry. Eliminates dusting problems.	Facilities installed late 1953. Method developed in cooperation with Mathieson Chemical Corp.
Sodium silicate	Cowles	Davison Chemical Corp., Lake Charles, La.	Newly patented process continuously reacts mixture of soda ash and sand in furnace with molten sodium silicate. Part of process for making catalyst.	Developed by Cowles Chemical Co.; Davison is only licensee. Gives higher purity, lower maintenance costs. Plant capacity 300 tons/day.



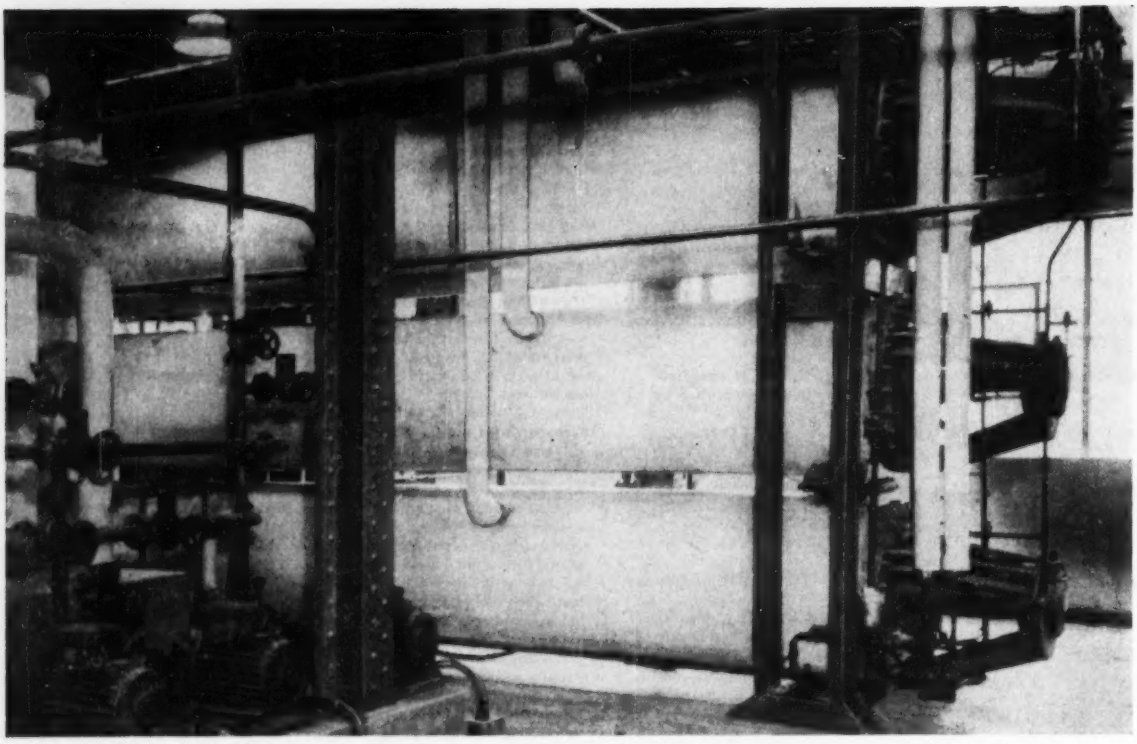
SULFUR—Floating power plant provides specially treated superheated water for underwater mining by Frasch process.

INORGANICS (Cont'd)

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Sulfur	Mining	Freeport Sulphur Co. Bay St. Elaine, La.	Floating power plant (see Water Treatment) provides superheated process water for mining sulfur under water.	Now in use.
Sulfur	Solidification	Petroleos Mexicanos Poza Rica, Mexico	Molten sulfur is solidified on waterborne stainless steel conveyor belt. Replaces cooling vats.	Cooling belt by Sandvik Steel Corp. Product handles easily, weathers better than crushed sulfur.
Sulfur, waste recovery	Catalytic converter	J. T. Baker Chemical Co. Penn Yan, N. Y.	Waste H_2S from CS_2 production is burned with air under pressure, then reacted over catalyst to form sulfur, which is scrubbed out in molten sulfur.	Used with company's new electrothermal carbon disulfide process, recovering 1.25 million lb. sulfur/yr.
Sulfuric acid	From magnesium sulfate	Chemiewerk Oranienburg Radebul, E. Germany	Byproduct is good grade of magnesia. Utilizes $MgSO_4$ from potash production.	In production.
Sulfuric acid	Fume scrubbing	Mathieson Chemical Corp. Pasadena, Tex.	SO_2 fumes are removed from waste gases in double scrubbing system using ammonium sulfite-bisulfite solution. First scrubber operates at low pH, second at higher pH.	$340,000 unit has solved air pollution problem of 500 ton/day acid plant.
Sulfuric acid	Kachkaroff - Guareschi	Various Europe	Designed to replace lead chamber process; produces sulfuric acid by combustion of sulfur-containing materials such as pyrites, spent oxide, cold gases from copper converters and gypsum. Reaction space only 0.4 cu. ft./lb. S/day. Makes extensive use of polyvinyl chloride linings.	Developed in Italy. Available in U. S. through International Processes, Inc., Chicago.
Sulfuric acid recovery	From refinery sludges	Consolidated Chemical Industries Baton Rouge, La.	Spent acid as weak as 65 percent is sprayed into combustion furnace. Gases are scrubbed, cooled, dried, then fed to contact converter.	400 ton/day plant in operation. Handles wide variety of sludges from Esso refinery.
Sulfuric acid recovery	Ruthner	Various Europe	Recovers entire sulfate equivalent of waste pickle liquors as sulfuric acid. Ferrous sulfate, after evaporation, is converted to ferrous chloride and removed by centrifuging. HCl is regenerated and recycled.	Process developed in Austria. Available in U. S. through Blaw-knox Co.
Zirconium tetrachloride	Direct chlorination	U. S. Bureau of Mines Albany, Ore.	Process uses direct chlorination of purified zirconium oxide rather than older, more wasteful process of chlorinating the carbide.	This process an intermediate step in making zirconium metal for AEC. Similar process used by Carborundum Metals Co. at Akron, N. Y.

METALS

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Aluminum	Electrolytic	Anaconda Aluminum Co., Kalispell, Mont.	Cells will use new vertical-spike Soderberg electrodes. Maintenance costs are markedly reduced, cryolite recovery increased.	Plant under construction. Electrode design developed by Elektrokemisk A/S Oslo.
Aluminum	Electrolytic	British Columbia Aluminum Co.	Electrical energy produced as "square" wave of current said to save 30 percent on power.	Process based on quantum mechanics.
Aluminum	Electrolytic	Reynolds Metals Co. Corpus Christi, Tex.	Giant cells, largest in the industry, are reported to be designed for 105,000 amp., 2–3 times conventional currents. Power consumption is probably less than with smaller cells.	$80-million plant started operations during 1952.
Aluminum	Sintering	.....	Slow sintering of powdered metal develops structure with superior fatigue strength at high temperature.	Developed in Switzerland!
Aluminum coating	Dip	General Motors Corp. Detroit, Mich.	Steel and other ferrous metals are dip coated with aluminum for corrosion resistance.	Can operate continuously. Called Aldip process.
Aluminum plating	Organic electrolytic	.....	Aluminum plated out from ether solution of reagent-grade $AlCl_3$ in presence of metal hydride such as lithium hydride.	Gives ductile, adherent coatings superior to other nonaqueous baths. Developed by Nat. Bureau of Standards.
Aluminum-silicon	Electrothermal	National Metallurgical Corp. Springfield, Ore.	Aluminum silicate clay will be smelted electrothermally in arc furnace to yield aluminum-silicon alloy, suitable for introducing silicon into aluminum (and possibly titanium) alloys.	Process developed with TVA and U. S. Bureau of Mines. Plant under construction for 2 million lb./yr.
Boron	Electrolytic	Cooper Metallurgical Associates Cleveland, Ohio	Electrolytic cell uses graphite anode and low-carbon iron plate cathode. Fused batch consists of potassium chloride or fluoride, potassium fluoborate and boron oxide.	Produces 99 percent pure boron.
Calcium	Preferential alcoholysis	Ethyl Corp. Baton Rouge, La.	Especially reactive calcium of 94–97 percent purity in free-flowing crystal form is separated from sodium-cell sludge by reacting sodium in sludge with an alcohol to form a marketable sodium alcoholate.	Expect reduction of refractory meta oxides of metals such as uranium, titanium, zirconium to be biggest use for this low-cost calcium. Process in operation.
Ferrochrome	Simplex	Electro Metallurgical Co. Marietta, Ohio	High-carbon ferrochrome is reduced in carbon content to less than 0.025 percent by high-vacuum furnacing with silica. Product goes into ELC stainless steels.	Plant in operation. Vacuum is produced by steam-jet system of record size.
Ferronickel	Ugine	Hanna Nickel Smelting Co. Riddle, Ore.	Process makes ferronickel directly from nickel silicate. "Hogged" waste wood mixed with ore charged to electric arc furnace gives more porous charge, better temperature control, lower carbon cost.	Developed by U. S. Bureau of Mines at Albany, Ore. $25-million plant will be first large-scale U. S. nickel production.
Indium	Electrolytic	Consolidated Mining Trail, B. C.	Process yields 99.95 percent pure metal, expected eventually to lower price.	Company plans commercial production of 70,000 lb./yr.
Iron	Electrolytic	.....	Dense, malleable iron sheets, 99.99 percent pure, are produced from pyrrhotite via ferrous chloride electrolysis in cell with graphite anodes and stainless steel cathodes. Sulfur is a byproduct.	Developed at Univ. of Vermont. Patents owned by Sulfide Ore Process Co. Plans underway for a commercial plant.
Iron	Reduction	.....	Heliheater reduces low-grade iron ore with carbon monoxide at 1,500 deg. F.	Developed by Theodore Swann, Birmingham (Ala.) consultant.
Lithium	Ore extraction	.....	Process extracts lithium from two different chemical combinations in same ore, 67 to 97 percent yield.	Developed by U. S. Bureau of Mines.
Lithium compounds and metal	From spodumene	Foote Mineral Co. Sunbright, Va.	Produces lithium salts and metal direct from spodumene without sulfuric acid. Ore contains 6 percent lithium oxide.	Plant in operation. New capacity at company's Kings Mountain, N. C., mine triples U. S. lithium ore output.
Manganese	Acid treatment	.....	Ore is treated with nitric acid.	Developed by E. S. Nossen Laboratories. 2 ton/day unit under construction.
Manganese	Ammonium carbamate leach	Manganese Chemicals Corp. Minneapolis, Minn.	Ore is reduced by roasting, then leached with carbamate solution. Mn is precipitated as carbonate.	Plans announced for $2-million plant to treat 200 tons ore/day. Process developed by Reginald Dean.
Manganese	Recovery	.....	Slast furnace and converter treatment of open-hearth slag.	Pilot-plant tests in progress at Pittsburgh under sponsorship of American Iron and Steel Inst. and U. S. Bureau of Mines.
Manganese concentrate	Flotation	Manganese, Inc. Henderson, Nev.	Ore assaying 18–25 percent is up-graded to a 48 percent nodule.	First beneficiation plant for low-grade manganese ore.
Nickel	Ammonia leaching	Sherritt Gordon Mines Ltd. Edmonton, Alta.	Similar to process used for cobalt Sherritt Gordon to produce copper, nickel and cobalt jointly.	Chemico's reduction process combined with user's ammonia leaching process. $41-million plant was to be completed late 1953.
Nickel plating	Kanigen	General American Trans. Corp. Chicago, Ill.	Nonelectrolytic process uses complex nickel chloride sodium hypophosphate solution. Can plate on most metals, plastics, glass. Costs 50c. to $1/mm. thickness/sq. ft.	GATC plans two plants, will license process to others.



PEANUT MEAL—Low-temperature solvent extraction avoids degradation of meal, which goes to make Ardil protein fiber.

METALS (Cont'd)

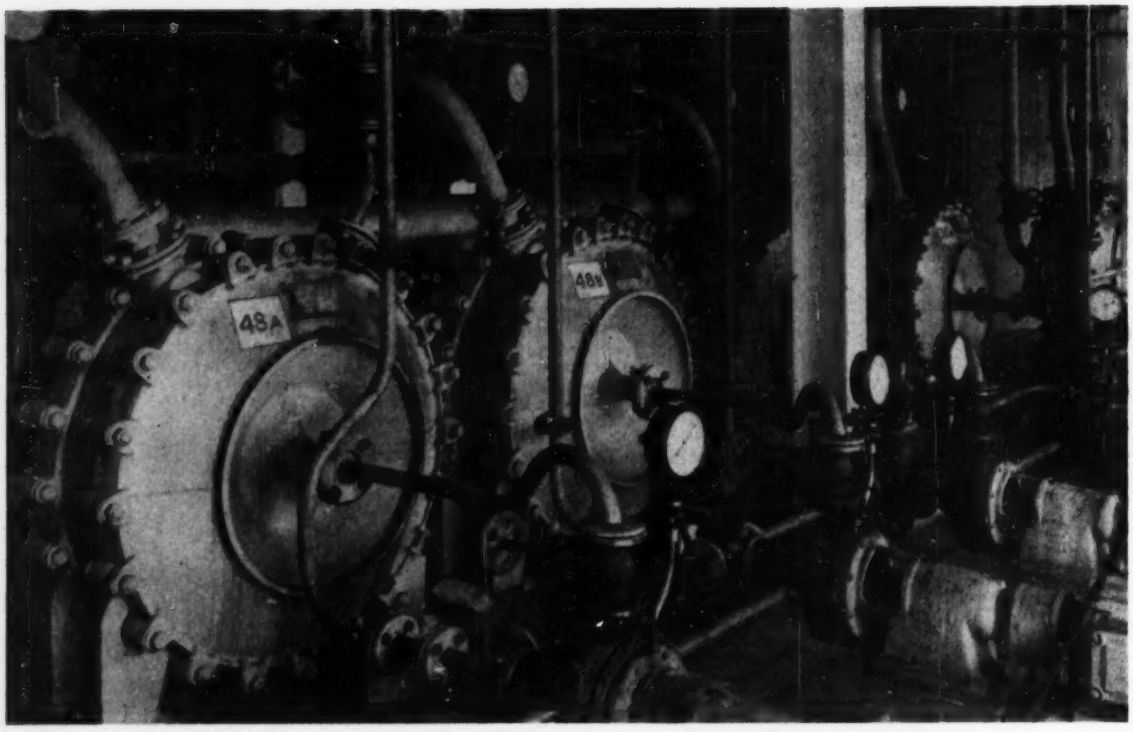
PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Rare earth metals....	Reduction.....	.....	Anhydrous rare earth chlorides are reduced by calcium in refractory oxide-lined containers.	Developed at Iowa State College. Produces metals in massive state.
Silicon	Iodide.....	Foote Mineral, Du Pont ..	Modified iodide (hot-wire) process, produces high-purity metal.	Pilot plants in operation.
Sodium.....	Solids coating	National Distillers Chemical Co. Ashtabula, Ohio	Molten sodium is coated onto solids such as salt, soda ash, carbon, alumina, giving extremely reactive product.	Production being marketed by U. S. Industrial Chemicals.
Thallium.....	Leaching.....	.....	Volatilization of white arsenic and cyclic leaching of lead smelter flue dust recover thallium values.	U. S. Bureau of Mines development.
Tin-nickel alloy.....	Plating.....	Metal & Thermit Corp.... Newark, N. J.	Alloy is 65 percent tin, 35 percent nickel.	Use has been limited by nickel shortage.
Titanium.....	Electrolytic.....	United International Research, Inc. Long Island City, N.Y.	Electrolytic cells melt titanium oxide down under a blanket of inert gas. Capacity is 4 lb. of sponge metal/hr./cell. Produces 99.2 percent Ti.	Pilot plant in operation.
Titanium.....	Smelting.....	.....	Titaniferous magnetite is alkaline roasted, leached and smelted to recover vanadium, iron and titanium.	U.S. Bureau of Mines laboratory development.
Titanium carbide....	Sintering.....	Kennametal Inc.....	High-pressure firing inside naval gun barrel produces uniform density of powdered-metal parts.	Used for jet-engine turbine blades.
Uranium.....	Acid leaching.....	Eldorado Mining Co..... Beaverlodge, Sask.	Chemical Construction's acid leaching process has been tried out on uranium ore concentrates.	Believed in pilot-plant stage. Probably suited to other uranium concentrates.
Uranium.....	Alkaline pressure leaching	.....	Uranium ore, containing pitchblende, is mixed with sodium carbonate solution and autoclaved continuously at 100 psi. in presence of air. Uranium solution then autoclaved with hydrogen and nickel catalyst.	Process developed at Univ. of British Columbia.
Uranium.....	From phosphate rock	Blockson Chemical Co..... Joliet, Ill.	Uranium is extracted in conjunction with production of phosphate chemicals from Florida rock.	Plant in operation. Others building units are Int. Minerals, Virginia-Carolina, Texas City Chemicals. AEC is now exploring recovery of uranium from phosphate deposit overburden.
Uranium.....	Ion exchange.....	West Rand Consolidated Mines, others; Krugersdorp, S. Africa	Uranium recovered from gold ore residues by ion-exchange processes developed for AEC.	U. S. and British capital building plants

METALS (Cont'd)

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Uranium concentrate	Ore treatment	U. S. Vanadium Co., Uravan, Colo.	Process comprises roasting, leaching, precipitation, filtration and drying. Recovers uranium and vanadium from ores with high lime content.	In operation since late 1952.
Vanadium	Ore processing	.....	Recovery from Western phosphate rock by beneficiating, smelting and roast-leach process.	Extensive tests by U. S. Bureau of Mines in Oregon and Idaho.
Zinc	Arc smelting	New Jersey Zinc Co., Palmerton, Pa.	Zinc oxide ore, coke and flux are preheated to 850–900 deg. C., then charged to three-phase arc furnace. Zinc vapor condenses in zinc spray condenser.	Over-all power in full-scale plant less than 3,000 kwh./ton slab zinc. First successful use of arc furnace for zinc. "Sterling" process.
Zirconium	Arc dissociation	Atomic Energy Commission	Zirconium metal produced by arc dissociation of halides in a continuous process.	Developed by National Research Corp. for AEC.
Zirconium	Modified Kroll	Carborundum Metals Co., Akron, N. Y.	Zircon sand is converted to zirconium carbide, thence to zirconium tetrachloride, which is purified of its hafnium content and reduced with magnesium to Zr metal sponge.	$2.5-million plant in operation; rated at 150,000 lb./yr.

FINE ORGANICS

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Anthraquinone	From naphthoquinone	American Cyanamid Corp. Bound Brook, N. J.	Butadiene is added to 1, 4-naphthoquinone, adduct is oxidized to anthraquinone.	Pilot plant in operation.
Antibiotic	Fermentation	Abbott Laboratories, Upjohn Co.	New commercial antibiotic, developed by Eli Lilly & Co., licensed to Abbott and Upjohn.	Called erythromycin.
Antibiotic	Fermentation	Charles Pfizer & Co., Brooklyn, N. Y.	Called Magnamycin, new antibiotic appears nontoxic but is effective against organisms resistant to earlier antibiotics.	Ineffective vs. gram-negative bacteria.
Azelaic acid	Molecular splitting	Kessler Chemical Co., Philadelphia, Pa.	Process involves molecular splitting of dihydroxystearic acid. Acid yields are greater and products are purer than previously possible.	May open new market for plentiful tallow.
Azelaic acid	Ozone oxidation	Emery Industries, Inc., Cincinnati, Ohio	Azelaic acid and coproduct pelargonic acid are made by ozone oxidation of oleic acid. Displaces chromic acid oxidation. Uses largest ozone generator.	Developed by joint research of Emery and Welsbach Corp. $2-million plant in operation.
Azo dyes	Coupling with flavonone glucosides	.....	Uses naringin and hesperidin, glucosides extracted from citrus peel.	Research by Florida Citrus Experiment Station, Lake Alfred, Fla.
Blood, human	Fractionation	.....	Plasma heat stability, improved by prothrombin removal, permits heat treatment to kill virus hepatitis.	Developed at Harvard Medical School.
Calcium gluconate	Electrolytic oxidation	.....	Starting with invert sugar, makes easy separation to yield high-purity levulose as coproduct.	Research done by Sugar Research Foundation.
Chlorophyll	Continuous extraction	Archer-Daniels-Midland Co. Mankato, Minn.	Converted soybean extractor removes chlorophyll from alfalfa. Miscella is saponified, converted to copper or iron salt.	Process gets about 5–8 lb. chlorophyllins/ton alfalfa.
Citrazinic acid	From citric acid	Charles Pfizer & Co., Brooklyn, N. Y.	Citric acid is reacted with NH_4OH, then hydrolyzed. Product is drug and dye intermediate.	Made on pilot-plant scale.
Citric acid	Deep fermentation	.....	Addition of a little methanol to culture medium permits deep tank fermentation, increases yield 12 times using blackstrap.	Developed by USDA. Pfizer, at Groton, Conn., and Miles Labs, at Elkhart, Ind., also have new deep tank processes.
Corticosterone, 17-hydroxy	Fermentation	Upjohn Co., Kalamazoo, Mich.	Process requires 15 steps, beginning with a mold containing progesterone. Over-all yield is 15 percent.	Synthesis is in laboratory stage.
Cortisone	Fermentation	Upjohn Co., Kalamazoo, Mich.	Uses progesterone from vegetable sources rather than scarce desoxycholic acid. Oxygen introduced at 11-position by fermentation.	Believed process opens way to cheaper cortisone, simpler process. $3-million plant is planned.
Cortisone	Total synthesis	Monsanto Chemical Co., St. Louis, Mo.	Process based on toluene as starting material. Fewer steps and better yields than earlier syntheses.	Still in experimental stage. $18.4-million certificate of necessity in hand, no plant plans yet announced.
Cyanoacetic acid	Solvent extraction	Kay-Fries Chemicals, Inc., West Haverstraw, N. Y.	Recovers product from aqueous solution. Solvent is methyl isobutyl ketone or mesityl oxide. Solvent is steam distilled, acid crystallized from water.	In production at rate of 1 million lb./yr.
Dextran	Enzymatic synthesis	.....	Enzymes are used to form high molecular weight polymer from sucrose. This eliminates a hydrolysis step.	Developed by USDA.



ACETIC ANHYDRIDE—Courtalds' new acetone cracking process features these Rosenblad spiral heat exchangers.

FINE ORGANICS (Cont'd)

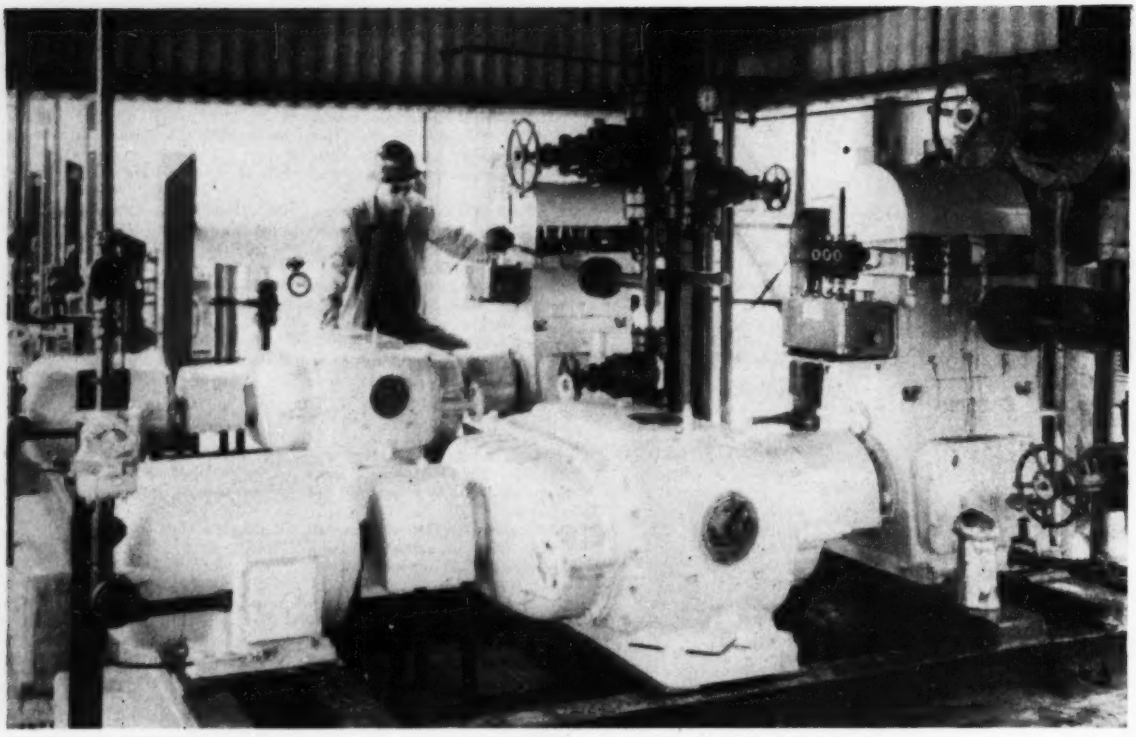
PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Dextran	Fermentation	Commercial Solvents Corp., others Terre Haute, Ind.	Cane sugar is fermented to glucose polymers, isolated, partially depolymerized with mineral acid, fractionally precipitated with an alcohol.	Used as plasma extender. Seven plants operating or building.
Dextrose	Wood hydrolysis	Rheinau Co. Regensburg, Germany	Produces crystallized dextrose from wood chips via three-stage, selective hydrolysis with varying concentrations of HCl followed by ion-exchange demineralization. Process claimed able to compete with dextrose from corn in U. S.	Process in pilot plant. Available for licensing through Karl Schoenemann Heidelberg, Germany.
o-Dichlorobenzene	Distillation	Allied Chemical & Dye Corp. Syracuse, N. Y.	Pure ortho is separated from other isomers by fractional distillation, with caustic and ammonia present to neutralize and inhibit the corrosive action of impurities.	In pilot-plant operation.
Dimethyl phthalates	Air oxidation	Hercules Powder Co. Burlington, N. J.	Xylenes are oxidized to isophthalic and terephthalic acids, which are then esterified. Products may compete with phthalic anhydride.	Being made in pilot plant up to 200,000 lb./mo.
Drying oil	Hydrolysis	Ethyl Corp. Baton Rouge, La.	Byproduct from ethyl chloride process is hydrolyzed to produce crude drying oil.	Duplicate unit installed in new Houston plant.
Furfuryl alcohol	Catalytic hydrogenation	Quaker Oats Co. Memphis, Tenn.	Furfural vapor and hydrogen reacted continuously in catalytic converter.	$600,000 plant in operation. Uses byproduct hydrogen from neighboring plant.
Gamma globulin	Blood separation	Armour & Co. Kankakee, Ill.	Process depends on close control of temperature and concentrations. Blood is centrifuged; then plasma is treated with alcohol and buffers in five precipitation steps.	Process is in use.
Glucoronolactone	Synthetic	Corn Products Refining Co. Argo, Ill.	Starts with dextrose. Details not available.	Plant in operation.
Hormones	Electrochemical synthesis		Electrolytic oxidation and reduction techniques promise increased yields, reduced costs.	Research being done at Pratt Institute.
Lactic acid	Alkaline degradation		Alkaline degradation of molasses reduces reaction time to minutes as compared to hours involved in fermentation process. Crude product is purified by solvent extraction.	Developed by USDA.

FINE ORGANICS (Cont'd)

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Levulose		Pfanstiehl Chemical Co. Waukegan, Ill.	Details not given. Said to be an improvement over classical method of fractional crystallization of calcium complexes.	In pilot-scale use.
Lubricants, synthetic	Oxidation		High-boiling esters of pinic acid are basis for new series of synthetic lubricants.	Developed in U.S. Government labs.
Lysine	Synthetic	E. I. du Pont de Nemours Niagara Falls, N. Y.	Synthetic process using furfural. Details not available.	Pilot plant in operation.
Maleo-pimaric acid	From pine gum	Several considering	Crude pine gum is diluted with turpentine, filtered, centrifuged and reacted with maleic anhydride. Crystals are centrifuged, washed, dried.	Developed on pilot-plant scale by USDA at Olustee, Fla. Yield about 20 percent on trash-free gum. Used in printing inks.
Mercuric acetate	Direct	Buffalo Electro-Chemical Co. Buffalo, N. Y.	Product usually made from mercury salt owing to poor reactivity of metal. New process reacts metal with special pure peracetic acid in glacial acetic medium.	Reduces cost, gives close to theoretical yield.
Methyl and dimethyl styrenes	Cracking of diaryl ethanes	American Cyanamid Co. Stamford, Conn.	Toluene or xylene is reacted with acetylene or acetaldehyde; resulting diaryl ethane is catalytically cracked to yield substituted styrene plus toluene or xylene.	Under pilot-plant investigation.
Methyl mercaptan		Thiochemicals, Inc. Port Arthur, Tex.	Product will be made from hydrogen sulfide derived from waste refinery gases. Previously it has been extracted from crude oil.	New $500,000 plant will get gas from Atlantic Refining Co. Product to be used to make methionine.
Montan wax	Extraction	Humacid Co. California	Two-step extraction, first with aromatic solvent, then with aliphatic hydrocarbon solvent. Controls resin content of wax.	Full-scale production.
Nitrofuran compounds	Synthetic	Norwich Pharmacal Co. Norwich, N. Y.	Automatic temperature and cycle control of nitration of furfural in presence of acetic anhydride needed owing to high heat of reaction. Resulting 5-nitrofurfural diacetate reacted with "semicarbazide" (hydrazine plus urea) to antibacterial 5-nitrofurfural semicarbazone.	Product Furacin has antimicrobial action similar to antibiotics but does not develop resistant bacterial strains. Furans and nitrofurans expected to find wide drug and solvent use.
Nonyl phenol		Jefferson Chemical Co. Port Neches, Tex.	New process, details not available.	Commercial unit in operation.
o-Phenanthroline	Synthetic	R. T. Vanderbilt	Compound is synthesized via a series of difficult reactions.	Product, being made on pilot-plant scale, is a nonmetallic drying agent for paints and inks.
Pinane hydroperoxide	Hydrogenation-oxidation		Pinene catalytically hydrogenated to pinane, then oxidized to hydroperoxide.	Developed by USDA at Olustee, Fla.
Polycarboxylic acids	Oxidation		Coal suspended in alkaline medium is treated with oxygen under heat and pressure.	Pilot studies at Carnegie Tech. Market survey by Scientific Design.
Polyvinyl pyrrolidone	Synthetic	Schenley Laboratories	Process starting with ethanolamine and butyrolactone avoids hazards of acetylene and high pressure.	
Pyridines	Synthetic	Ansul Chemical Co. Marinette, Wisc.	Process makes gamma-picoline, alpha-picoline, 2-methyl 5-ethyl pyridine, lutidines and collidines.	Pilot plant in operation, semi-commercial unit planned for 500,000 lb./yr.
Pyridines	Synthetic	Reilly Tar & Chemical Co. Indianapolis, Ind.	Acetylene and NH_3 react to form pyridine, alpha, beta, and gamma-picolines.	Plant in operation; capacity 4 million lb./yr.
Trifluoroacetic anhydride	Dehydration	Minnesota Mining & Mfg. Co. St. Paul, Minn.	As catalyst for esterification, TFA anhydride goes to the acid. Anhydride can be recovered by reacting acid with stabilized sulfur trioxide.	
Vanillin	Sulfite liquor oxidation	Ontario Paper Co. Thorold, Ont.	Uses lime instead of NaOH for forming the lignosulfonate. Specific reaction conditions are critical.	$1.3-million plant in operation. Capacity 400,000 lb./yr.
Vitamin A	Synthesis from cyclohexanone	Glaxo Laboratories Middlesex, England	Replaces expensive beta-ionone as starting material with cyclohexanone.	In research stage.
Vitamin B_{12}	Extraction		Dried sewage plant sludge is extracted countercurrently with water.	Pilot plant under construction. Process developed by V. E. Alden Co., Chicago.
Vitamin B_{12} supplement	Fermentation	Pacific Yeast Products Wasco, Calif. Atlantic Yeast Co. Brooklyn, N. Y.	Feed supplement produced using selected strain of bacteria on sugar-containing byproducts.	Development sponsored by USDA.

HEAVY ORGANICS

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Acetic acid and anhydride	Butane oxidation	Celanese Corp. of America. Pampa, Tex.	Compressed air is used to catalytically oxidize normal butane at higher pressures and lower temperatures than used at Bishop plant. Formaldehyde is not a product.	First units of commercial plant are in operation. Capacity 1.8 million lb./week of acid. Makes wide use of sieve-plate towers and air-cooled exchangers.
Acetic anhydride	Acetone cracking	Courtalds, Ltd. Coventry, England	Addition of CS_2 to feed depresses dehydrogenation side reaction in stainless steel reactor tubes. Quick quench with acetic acid gives the anhydride.	On stream early 1953.



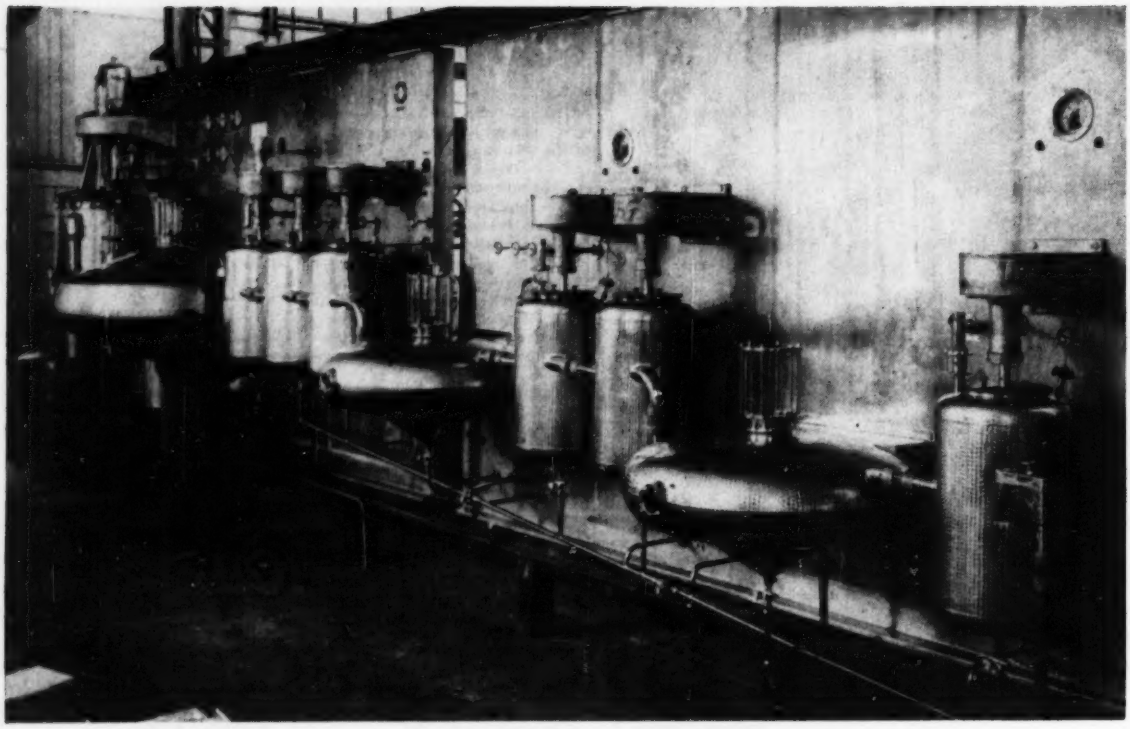
ACRYLIC MONOMERS—Acetylene-based process uses these high-pressure pumps in the preparation of nickel carbonyl.

HEAVY ORGANICS (Cont'd)

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Acrylic monomers	From acetylene	Rohm & Haas, Deer Park, Tex.	Acetylene reacts with CO and alcohol; reaction is initiated with nickel carbonyl.	$8-million plant in operation; replaces ethylene-based process.
Adipic acid		Allied Chemical & Dye, Hopewell, Va.	New process will be used, presumably related to production of caprolactam.	Will be used in Allied's production of nylon, possibly also for adipic esters.
Aniline	Continuous	Allied Chemical & Dye, Moundsville, W. Va.	Nitrobenzene will probably be made continuously via the Biazzi process. Reduced to aniline by continuous catalytic hydrogenation.	Plant start-up scheduled late 1953.
Benzene	Cracking and oxidation of paraffins	All-Union Institute of Gas & Synthetic Fuel Ishambejewo, Russia	Hydrocarbon gases are catalytically cracked to olefins, then oxidized with air to benzene and other aromatics.	Pilot-plant results were promising; full-scale plant a strong possibility. Developed by Joseph Winkler.
Benzene	Pressure refining	Scholven Chemie A. G., Germany	Catalytic process for coke-oven benzene. Higher purity and yield than acid refining.	Introduced in several plants.
Benzene hexachloride	Continuous	Pennsylvania Salt Mfg. Co. Calvert City, Ky.	New more efficient continuous process.	Construction underway for operation early in 1954.
Coal char	Fluidized coking	Illinois Coal Products Comm. Chicago, Ill.	Fluidized coal is oxidized at 300 deg. to destroy resinous compounds, then coked in fluidized state mixed with hot char at 500-800 deg. C. Pilot plant, 2 tons/hr., started mid-1952.	Char can be burned direct or briquetted. Typical yield per ton coal is 1,320 lb. char; 15 gal. tar; 8,200 cu.ft. of 580-Btu. gas; 35 lb. sulfur in H_2S. Developed by A. D. Singh.
Coal chemicals	Hydrogenation	Carbide & Carbon Chemicals Corp. Institute, W. Va.	Large scale pilot plant treats 300 tons/day of coal to produce aromatics by improved high-pressure hydrogenation. Operates at 4,-6,000 psi. and 840-1,000 deg. F. No converter coking.	Believed to be first high-pressure coal hydrogenation designed primarily for chemicals production. Rate increase to 550 tons/day planned. Plant cost $11 million.
p-Cresol	p-Cymene oxidation	Hercules Powder Co. Gibbstown, N. J.	Similar to phenol-from-cumene process, using similar or same equipment. Para-cymene is oxidized, splits to para-cresol and acetone.	Uses dehydrogenated monocyclic terpenes from Georgia and Mississippi nava stores operations as raw material.
p-Cresol	Synthetic (ex toluene)	Sherwin-Williams Co. Chicago, Ill.	Conventional process improved by substituting byproduct sodium sulfite for sodium carbonate as neutralising agent and using sulfur dioxide so produced to release p-cresol from sodium p-cresolate.	Improved process being put into use early 1953.
DDT	Fluosulfonic acid	Dominion Rubber Co., Ltd. Elmira, Ont.	Monochlorbenzene and chloral are reacted with fluosulfonic acid rather than sulfuric as condensing agent. Reaction speed is increased 20–30 times.	Saves 20 percent in investment, increases yield 10 percent, cuts manufacturing cost. Process available for licensing.
Ethylene oxide	Direct oxidation	Allied Chemical & Dye, Orange, Tex.	Direct oxidation of ethylene, requires no chlorine.	Developed by Scientific Design Co. $5-million plant under construction.

HEAVY ORGANICS (Cont'd)

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Ethylene oxide	Direct oxidation		Direct oxidation of ethylene with oxygen in fixed bed produces ethylene oxide. Hydration produces ethylene glycol.	Developed by Shell Development Co., available through Lummus Co.
Ethylene oxide	Fluid bed		Ethylene is oxidized with air in fluidized bed of silver catalyst, giving better temperature control, higher yields, compared with fixed-bed processes. Operates at 100 psi., 500 deg. C.	Developed jointly by Atlantic Refining Co. and Vulcan Copper & Supply Co. Latter will build commercial plants.
Formaldehyde	Vapor-phase oxidation	Reichhold Chemicals, Inc., Seattle, Wash. (and elsewhere)	Methanol oxidation process substitutes mixture of metal oxides for usual silver catalyst, gets 95 percent yield compared with usual 85–88 percent. No rectification or stripping needed.	Seattle plant operating; others to be built. Simpler equipment means much lower plant cost. Expect to produce 120 tons/day by 1954.
Glue	Continuous	Swift & Co., Chicago, Ill.	Improved appearance, odor and performance due to closely controlled continuous process.	Now operating.
Hydrocarbon sulfonates	Alkylation-sulfonation	Universal Detergents, Inc., Los Angeles, Calif.	Aromatic petroleum derivatives are alkylated and sulfonated in a single step.	In commercial operation, 25 tons/day.
Hydrocarbon sulfonates	SO_3 sulfonation	Ninol Laboratories, Chicago, Ill.	Sulfonation with stabilized SO_3 is cheaper, makes products unobtainable by other methods.	Plant operating at 10 million lb./yr. Similar process also being used by Vosco Industrial Products, Inc., Montreal, probably by Tennessee Corp., Copperhill, Tenn.
Iso-octyl alcohol	Oxo	Gulf Oil Corp., Port Arthur, Tex.	Reacts a heptene olefin, CO and hydrogen at relatively high pressure, low temperature, in presence of cobalt catalyst, producing iso-octaldehyde, which is hydrogenated to iso-octyl alcohol.	This is third petroleum company to develop an iso-octyl alcohol synthesis based on German-developed Oxo process.
Maleic anhydride	Solvent absorption		Anhydride is recovered from converter gases by absorption in dibutyl phthalate, followed by reduced-pressure distillation. Equipment can be used interchangeably for phthalic anhydride.	Plant underway in Europe. Process developed by Scientific Design Co., New York.
Methanol	Synthetic	Heyden Chemical Corp. & Monsanto Chemical Co. Texas City, Tex.	Off-gas from natural gas-based acetylene plant is starting material.	Commercial production at 25 million gal./yr. expected in 1955.
Nitroglycerine	Continuous nitration	Canadian Industries Ltd., Calgary, Alta.	Saves on equipment cost, labor, building space. Small amount of material in process reduces hazards. Can be adapted to other nitration products.	Developed in Switzerland by M. Biazzi. Units also in operation by Du Pont at Martinsburg, W. Va., Hercules at Radford, Va., and Naval Ordnance at Indian Head, Md.
Oxygenated chemicals	Modified Fischer-Tropsch		Synthesis gas is bubbled through a slurry of nitrided iron catalyst. Yield of oxygenated chemicals is several times that obtained with reduced iron catalyst.	Developed by U. S. Bureau of Mines.
Paraffin, hard	Modified Fischer-Tropsch	Krupp-Kohlenchemie, Wanne-Eickel, Germany	Details not available.	Developed in collaboration with Ruhr Chemie and Lurgi.
Phenol	Cumene oxidation	B. A.-Shawinigan, Ltd., Montreal, Que.	Cumene (from benzene and propylene) is oxidized to cumene hydroperoxide, which then splits to phenol and acetone.	First plant to use this process now operating. Capacity 13 million lb./yr. phenol. Several other companies are building similar plants.
Sorbitol	Catalytic	Atlas Powder Co., Atlas Point, Del.	Continually improved since introduction in 1947, process uses nickel catalyst to reduce corn sugar at high pressure with hydrogen. Product purified by ion exchange.	Improved continuous process has permitted Atlas to quadruple capacity since 1951.
Starch, corn	Drying	American Maize Products Co. Hammond, Ind.	Flash dryer handles feed at 35 percent moisture, delivers 300,000 lb./day dry starch.	First major unit for corn starch went on stream Feb. 1952.
Starch, oxidized	Electrolytic	Aktiengesellschaft A. Hering Nurnberg, Germany	Water slurry of starch with 5 percent NaCl is electrolysed in diaphragmless cell producing NaOCl which decomposes, producing nascent oxygen.	Process pilot-planted.
Styrene oxide	Continuous	Dow Chemical Co., Freeport, Tex.	Continuous process, using low-cost raw materials, produces a high-quality product. Probably involves styrene chlorohydrin as intermediate.	Semicommercial unit in operation, producing more than 10,000 lb./mo.
Sugar, beet	Continuous diffusion	Spreckles Sugar Co., Woodland, Calif.	Battery of multiple cells provides continuous beet extraction.	Manufactured by Oliver United Filters. First test unit 1948.
Synthesis gas	Coal partial combustion	E. I. du Pont de Nemours Belle, W. Va.	Fluidized bed of finely crushed coal is burned in presence of steam and deficiency of oxygen to give CO and hydrogen. Eliminates coke ovens, gas generators and air pollution.	$4-million unit under construction as of July 1953. Designed in cooperation with Babcock & Wilcox.
Synthesis gas	Purification		H_2S, organic S and CO_2 are removed by low-temperature selective extraction. Known as Rectisol. Nature of solvent undisclosed.	Developed in Germany by Lurgi. Offered by Blaw-Knox. Going into South African Fischer-Tropsch plant.
Synthesis gas	Purification	U. S. Bureau of Mines, Bruceton, Pa.	Carbon dioxide is removed from synthesis gas by absorption in hot concentrated potassium carbonate at 300–600 psi. Solution regenerated by low-pressure steam stripping.	Expect process also to be useful in ammonia synthesis.



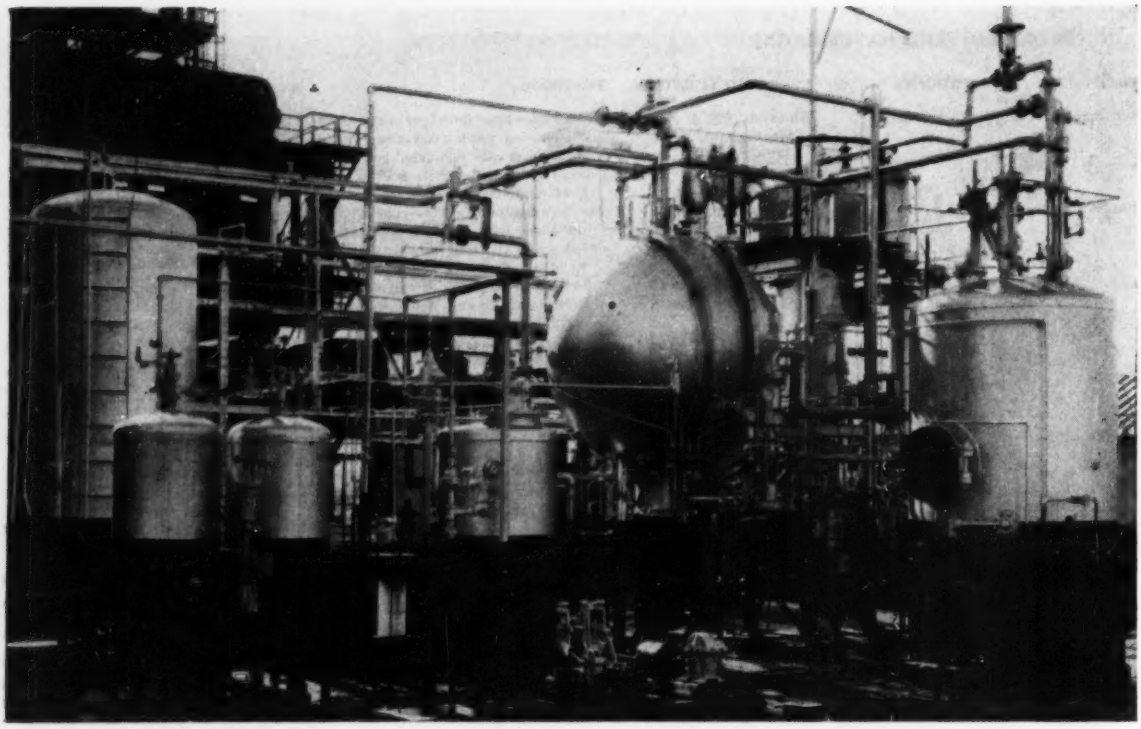
NITROGLYCERINE—Biazzi continuous nitration process reduces hazards, saves labor, space and equipment costs.

HEAVY ORGANICS—(Cont'd)

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Trichlorethylene	Tetrachlorethane pyrolysis	Hooker-Detrex Corp. Ashtabula, Ohio	Tetrachlorethane is thermally decomposed, yielding HCl as coproduct.	Existing plant being converted to new process. HCl will be piped to General Tire & Rubber to make vinyl chloride.
Trinitrotoluene	Continuous		Process reduces hazards of TNT production. Only 1/25 as much explosive present in process at any one time as in a batch plant of the same daily capacity.	Developed by J. Meisener in Germany.
Urea	Inventa	Hovag Ems, Switzerland	Process separates unreacted ammonia and carbon dioxide by special absorber solution, prior to recycle and separate repressuring. Novel crystallization crystallizes from urea melt for better crystal control.	Offered in U. S. by Vulcan Copper & Supply Co. at $25–$35,000 investment/daily ton capacity. Expect 98 percent yield on ammonia.
Urea	Montecatini		Mild reaction conditions and proper construction materials minimize corrosion problems. NH_3 and carbamate are partially recycled in liquid form. Conversions are 70 percent on NH_3 and 80 percent on CO_2.	Developed in Italy, available in U. S. through M. W. Kellogg Co.
Urea	Chemico	Sumitomo Chemical Co. Niihama, Japan	Excess NH_3 is separated as gas, condensed without compression and recycled by pumping. Conversion is 76 percent per pass, over-all NH_3 efficiency 97 percent. Special granulator produces uniform spherical pellets.	Process available through Chemical Construction Corp. Japanese plant in operation.
Vinyl acetate	Acetylene-less	Celanese Corp. of America. Pampa, Tex.	New process, details not disclosed, uses no acetylene.	Plant in operation, capacity 30 million lb./yr.
Vinyl chloride	Catalytic		A complex salt of mercury and barium chloride is used to catalyze reaction of acetylene and HCl to vinyl chloride. Process can use a gas containing only 10 percent acetylene.	Developed by Univ. of Texas. Process only bench scale so far.
p-Xylene	Hydroforming	Standard Oil Co. (Ind.) Whiting, Ind.	Certain petroleum fractions will be converted to mixed aromatics by Hydroforming. Mixture will be separated to recover p-xylene and benzene.	Plant being built for Jan. 1955 operation will produce 14 million lb./yr.
p-Xylene	Low-temperature recrystallization	Humble Oil & Refining Co. Baytown, Tex.	Mixed xylenes are crystallized at −95 deg. F., recrystallized at 0 deg. F., using scraped-surface heat exchangers.	Plant in operation. Supplies p-xylene to Du Pont for Dacron via terephthalic acid.

PETROLEUM AND NATURAL GAS

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Aromatics	Platreating	Roosevelt Oil & Refining Mt. Pleasant, Mich.	Process uses byproduct hydrogen from a Platforming unit to saturate the olefins in an aromatic distillate, permitting recovery of aromatics in a Udex unit. Uses platinum-base catalyst.	Developed by Universal Oil Products Co. Unit is on stream.
Butadiene	Catalytic purification	Dow Chemical Co. Freeport, Tex.	Selective catalytic hydrogenation of crude butadiene from ethylene manufacture eliminates C_4 acetylenes; then purified by distillation and extraction.	Process in use in $3.5-million plant.
Carbon black	Controlled combustion	Lynn Carbon Black Co. San Angelo, Tex.	Much higher yield than existing processes and much lower equipment cost. Claimed to enable new process to be used economically in small flare-gas supplies at refineries.	Lynn will license process.
Ethylene	Steam pyrolysis of ethane		Steam serves as heat-transfer medium, diluent and carbon formation suppressor. Operates with steam temperature of 1,700–1,900 deg. F.	Research underway at Midwest Research Inst.
Fuel gas	Thermal cracking		Cracking of propane, butane and natural gasoline in a 2.5-in. dia. tube furnace at 3 atm. pressure. Reaction times are on the order of 11 sec.	Developed by Inst. of Gas Technology. Process makes natural gas substitutes and can be used to supplement normal gas supplies during peak demand.
Fuel gas	TPC		Thermofor pyrolytic cracking process produces 950–1,050-Btu. fuel gas from reduced crudes or other heavy petroleum fractions. Uses a bed of moving solid coke particles as a pebble heater to heat charge and retain carbon resulting from cracking.	Process resembles Socony-Vacuum's TCC process. Developed by Surface Combustion Corp. in cooperation with Socony-Vacuum.
Gasoline	Catalytic reforming	Sinclair Refining Co. Marcus Hook, Pa.	New platinum catalyst said to give higher activity over longer periods of time and to have greater ability to convert low-octane paraffins to high-octane aromatic gasoline.	Developed jointly by Sinclair and Baker & Co. Engineering of new 16,000-bpd. unit by C. F. Braun & Co. for completion mid-1954. Process available for license; Pure Oil plans unit.
Gasoline	Fluid cracking	Imperial Oil Ltd. Edmonton, Alta.	Model IV fluid-cracking unit uses new catalyst circulation system to reduce height, saves 30 percent of steel cost. Saves in maintenance cost by eliminating slide valves.	Developed by Standard Oil Development Co. IOL unit designed for 11,000 bpd.
Gasoline	Fluid Hydroforming	Pan Am Southern Corp Destrehan, La.	Uses fluidized catalyst technique. Upgrades naphtha to higher octane ratings.	First unit for 2,000 bpd. in operation. Developed and engineered by M. W. Kellogg Co.
Gasoline	Gum removal	Esso Standard Oil Co. Bayway, N. J.	Formaldehyde replaces sulfuric acid in removing gum-forming constituents.	Announced Jan. 1952.
Gasoline	Hyperforming	Union Oil Co. Los Angeles, Calif.	Upgrades low-octane naphthas by reforming at 800–900 deg. F. with cobalt molybdate catalyst. Uses Hyperflow principle for catalyst lift.	Two units being engineered. Process available for license.
Gasoline	TCR	Various	Thermofor catalytic reforming process upgrades low-octane stocks into premium fuels. Low-pressure regenerative moving-bed process, chromia-alumina gel catalyst. Coking no problem.	Developed by Socony-Vacuum Oil Co. At least four commercial units scheduled.
Lubricating oils	Acid treatment	Various Italy	Two-stage centrifugal process. Short contact time avoids chemical action, increases yield and reduces acid consumption.	Several refineries using this process.
Lubricating oils	Continuous percolation		Continuous countercurrent percolation technique for decolorising lubricating oils and waxes. Clay used for decolorizing is continuously fed into oil. Spent clay is drawn off, washed with naphtha and recycled.	Developed by Socony-Vacuum Oil Co. One unit in England, another in Holland under construction.
Petroleum distillates	Autofining	Anglo-Iranian Oil Co., Ltd. Llandarcy, Wales	Process applicable to sour crudes gives virtually complete yield of middle distillates without desulfurising loss inherent in acid treatment. Eliminates 90 percent of sulfur.	M. W. Kellogg Co. licensed to build U. S. plants.
Petroleum distillates	Desulfurization		Catalytic vapor-phase desulfurization process for use on distillates from naphthas to heavy diesel fuels removes sulfur as H_2S or other compounds.	Bench-scale work completed by Wigton-Abbott Corp.; large pilot plant contemplated Mar. 1953
Petroleum distillates	Hydrodesulfurization	Shell Oil Co. Stanlow, England	Liquid-phase process can handle heavy charge stocks, eliminates need for vaporization, achieves longer on-stream periods.	Unit under construction as of mid-1953. Available through Lummus Co.
Petroleum hydrocarbons	Contact coking	Shamrock Oil & Gas Corp. Sunray, Tex.	Coke deposited on moving bed of hot coke particles. Continuous process, yields high-quality coke. Uses Hyperflow lift principle.	Plant in operation, 1,000 bpd. capacity. Developed by Lummus Co.
Petroleum hydrocarbons	Desaponification		Soap-containing charge is acidified, salt and aqueous phase are coalesced by electric field.	Developed by Petrolite Corp.



PETROLEUM TREATING—Petreco process uses an electric field to help coalesce dispersed aqueous phases.

PETROLEUM & NATURAL GAS PRODUCTS (Cont'd)

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Petroleum hydrocarbons	Electric treating	.....	Electric field coalesces dispersed aqueous phase from acid, caustic or doctor treating	Developed by Petrolite Corp.
Petroleum hydrocarbons	Fluid coking	Standard Oil Co. (N.J.) Three units	Crude-oil residuum is injected into hot fluidized bed of coke particles, converted into lighter oils and coke. Coke stream is reheated in another vessel, with coke make withdrawn continuously.	Three units planned—3,000 bpd. at Billings, Mont., 10,000 at Baltimore, Md., 20,000 at Baton Rouge, La.
Petroleum hydrocarbons	HF extraction	.....	Countercurrent stream of liquid HF removes coke-formers and S compounds from cracking charge stocks and naphthas.	Developed by Standard Oil Co. (Ind.). Designs prepared up to 40,000 bpd.
Shale oil	Pipeline retort	U. S. Bureau of Mines Laramie Wyo.	Shale crushed to -¼ in. is carried by superheated steam through a reactor tube at 900-1,800 deg. F. with not over 3 sec. exposure.	1-ton/day pilot plant shows superior results compared with other retorting methods; also produces large quantities of aromatic chemicals.

PLASTICS AND RESINS

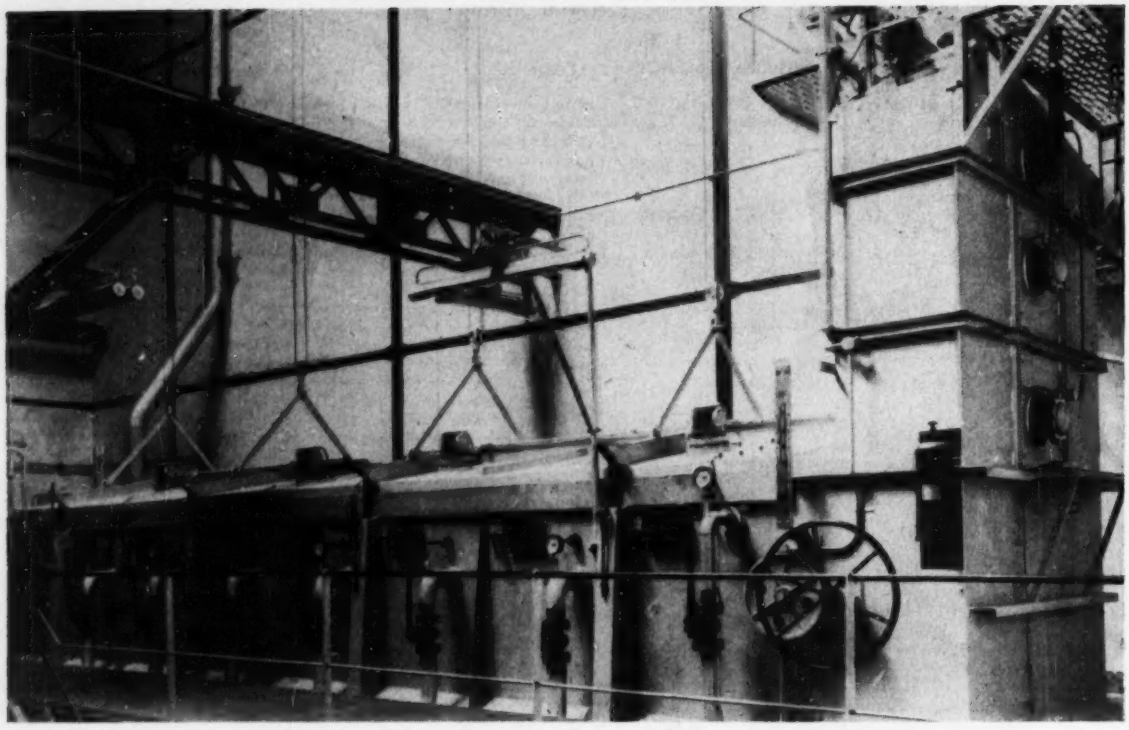
PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Chlorinated polyesters	From pentane and maleic anhydride	Hooker Electrochemical Co. Niagara Falls, N. Y.	Pentane is chlorinated and cyclized, reacted with maleic anhydride, esterified with glycols.	In production. Resin is fire-resistant, stable to heat.
Fluorocarbon	Continuous	M. W. Kellogg Co. Jersey City, N. J.	Kel-F made by new continuous process, probably at lower cost.	
Foamed plastic	.....	Lockheed Aircraft Co. San Diego, Calif.	Isocyanate or phenolic base foam plastic fills cavities in aircraft structures, provides stiffening.	Licensed to American Latex Co. and Nopco Chemical Co.
Polyester film	Condensation polymerization	E. I. du Pont de Nemours & Co. Circleville, Ohio	Condensation of ethylene glycol and terephthalic acid. Known as Mylar, product resembles Dacron, is made into high-strength transparent or translucent film as thin as 0.00025 in.	$10-million plant under construction. Related product will be made into photographic film base at Parlin, N. J., by continuous polymerization and casting.
Polyester, modified	Polymerization	.....	Based on ethylene glycol, adipic acid and di-isocyanate. Used in rubber heels, cable covers, fabric coatings.	Developed in Germany by O. Bayer. Called Vulkollan.
Polyethylene, modified	Chlorosulfonation	E. I. du Pont de Nemours Belle, W. Va.	Polyethylene is chlorosulfonated to make ozone-resistant elastomer.	Called Hypalon S-2, will be blended with natural and synthetic rubbers.

PLASTICS AND RESINS (Cont'd)

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Polymers	High-energy irradiation	General Electric Co. Schenectady, N. Y.	Few seconds exposure to particle bombardment produces cross-linking of long-chain polymers such as polyethylene, nylon, polystyrene, polyvinyl alcohol, polyvinyl chloride and Carbowax.	Tests conducted in atomic pile in England and with a million-volt X-ray machine at G. E. in the U. S.
Polyvinyl alcohol	Continuous	E. I. du Pont de Nemours & Co. Niagara Falls, N. Y.	PVA is made by new continuous alkaline hydrolysis process. Details unavailable.	
Resins, synthetic	Outdoor kettle	Reichhold Chemicals, Inc. Elizabeth, N. J.	First outdoor installation for resin production in Northern climates. Special insulation protects against cold weather.	Trial installation may lead to wider adoption of outdoor plants in the North.
Resin, water-dispersed	.....	Reichhold Chemicals, Inc. Detroit, Mich.	New resin contains three components, a phenol-formaldehyde resin, an alkyd resin and ammonia to make mixture water soluble. Finishes must be baked.	Expect new resin to be useful in metal finishes, saving users 10-25 percent compared with present coating costs. Called Hydrophen.
Teflon-metal mixtures	Sintering	U. S. Gasket Co. Camden, N. J.	Teflon properties improved for many purposes by combining with inorganic fillers and/or metal particles. Mixture is compressed and sintered as in powder metallurgy.	Reduces cost compared with straight Teflon, improves physical and mechanical properties for such uses as bearings, pump impellers.

PULP AND PAPER

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Battery separators	Wood fibrization	Evans Products Co. Coos Bay, Ore.	Wood is fiberized and reformed into finished separators.	In production.
Black liquor recovery	Combustion	Combustion Engineering, Inc. Chicago, Ill.	Rearrangement of heating surfaces in superheater cuts slag formation, spray gun delivers superheated feed which gives partial flash drying.	
Cellulose	From banana stalks.	Cia. de Cellulise Banex Brazil		Process developed in Britain, known as Polpex.
Crepe paper	.....	General Electric Co. Pittsfield, Mass.	Made of kraft and manila fibers, has triple the strength of previous industrial crepe paper.	Used for cable wrapping.
Hardboard	Resin-binder	Anacortes Veneer, Inc. Anacortes, Wash.	Douglas fir veneer waste is chipped, steamed, cooked, ground, mixed with 1-3 percent resin, felted, pressed and cured, all in semidry condition.	$1-million automatic plant turning out 90,000 sq. ft. ¼-in. hardboard per day with 30 men.
Kraft corrugating medium	Semichemical	Camp Mfg. Co. Franklin, Va.	Deaeration and presoaking of chips used in continuous process.	Used in 50 ton/day plant.
Kraft paper	Kraft	.....	Made from mixture of Southern pine waste wood and normal pine pulp.	Developed by Herty Foundation, Savannah, Ga.
Kraft pulp	Odor control	Nekoosa - Edwards Paper Co. Nekoosa, Wisc.	Chemical agent added to digester masks odors throughout pulping and recovery systems.	Developed by Du Pont, used on trial at Nekoosa.
Kraft pulp	Odor control	Weyerhaeuser Timber Co. Springfield, Ore.	Odorous sulfide-containing vapors from kraft cooking liquors are oxidized when liquor passes down through a tower cocurrent with air.	Process treats 300 gpm. black liquor with 3 g./l. sulfides, using 10 cfm. air/gal. liquor.
Lignosol	Concentration	Lignosol Chemicals, Ltd. Quebec City, Que.	Concentrated lignin liquor or powder made from waste sulfite liquor.	
Newsprint	Alkaline extraction of bagasse	Valentine Pulp & Paper Co. Lockport, La.	First commercial mill for newsprint from bagasse will use rapid processing cycle, including prehydrolysis followed by alkaline extraction and light but conventional refining.	Spending $2.6 million for 50 ton/day mill. Rayon Corp. of the Philippines plans to make dissolving pulp from bagasse.
Newsprint	Chemigroundwood	Great Northern Paper Co. E. Millinocket, Me.	First use of hardwood for newsprint in N. America. Process involves pretreatment of hardwood in pressure vessels, followed by grinding. Product is mixed with softwood pulp.	Experimental work completed. Great Northern is expanding output, including facilities for new process.
Newsprint	Papermaking	Beloit Iron Works Beloit, Wisc.	Transfers fragile web from fourdrinier wire to press section, permits higher running speeds.	
Papermaking	Press roll load control	Gibraltar Corrugated Paper N. Bergen, N. J.	Strain-gage load meter, measures roll loading within 0.25 percent.	Installed and operating.
Papermaking	Weight control	Strathmore Paper Co. W. Springfield, Mass.	Absorption beta gage assures uniformity, holds sheet weight to less than 3 percent variation.	Installed and operating.
Pulp (bleached)	Chlorine dioxide	Riegel Carolina Corp. Acme, N. C.	Plant manufactures own chlorine dioxide from sulfuric acid, sodium chlorate, methanol vapor and air. Water solution at 160 deg. F. is used as last bleaching stage for pulp after hypochlorite bleaching.	Plant built and process developed by Solvay Process Div., Allied Chemical & Dye Corp.
Soda pulp	Cold caustic digestion	Green Bay Pulp & Paper Co. Green Bay, Wisc.	Chips soaked 2-3 hr. in 2.5 percent NaOH at room temp., drained, steamed, pulped in double-disk refiner. Cycle requires 4 hr. Used as 1 percent stock.	Being used as 25-60 percent mixed with semichemical pulp for making corrugate.



VEGETABLE OILS—De Smet solvent extraction process, developed in Belgium, uses horizontal moving screen.

PULP AND PAPER (Cont'd)

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Sulfate pulp	Continuous		Continuous process eliminates prehydrolysis. Pulp is satisfactory for viscose and acetate manufacture.	Developed at Univ. of Florida.
Sulfite pulp	Evaporation		Lime in liquor crystallizes on bed of lime salts, eliminating fouling.	Built by Struthers-Wells, trials conducted early 1952.
Sulfite pulp	Magnesia base	Weyerhaeuser Timber Co., Longview, Wash.	Process substitutes MgO for lime. Big advantage is nonpollution of streams—all waste liquors are burned for power generation.	Now operating commercially on 300 ton/day scale. Process will be used also by Ketchikan Pulp Co. in new Alaskan mill.
Sulfite pulp	Soda-base pulping	Nekoosa-Edwards Paper Co. Port Edwards, Wisc.	Process substitutes caustic soda for limestone in making sulfite cooking liquor. This is expected to make cooking liquor recoverable and so cure pollution problem.	Developed by Western Precipitation Co. About 500 tons of pulp has been made by this process but critical evaluation of recovery process will be needed before a decision to go ahead.
Sulfite pulp	Waste disposal		Calcium-base waste sulfite liquor burned without auxiliary fuel.	Developed at Washington State College.
Wood panelboard	Continuous	Bartrev, Ltd Colchester, England	Resin-treated wood particles are fed in continuous carpet on stainless steel belt, bonded by heat and pressure, emerge as continuous length of board.	Available in U. S. through Aries Fiberboard Corp., New York.
Wood pulp	Va-Purge	Various	Preliminary steaming and purging step gives faster, more complete liquor penetration of wood chips, shortens cooking time, increases yield and uniformity.	Undergoing trials in a number of mills.

RUBBER

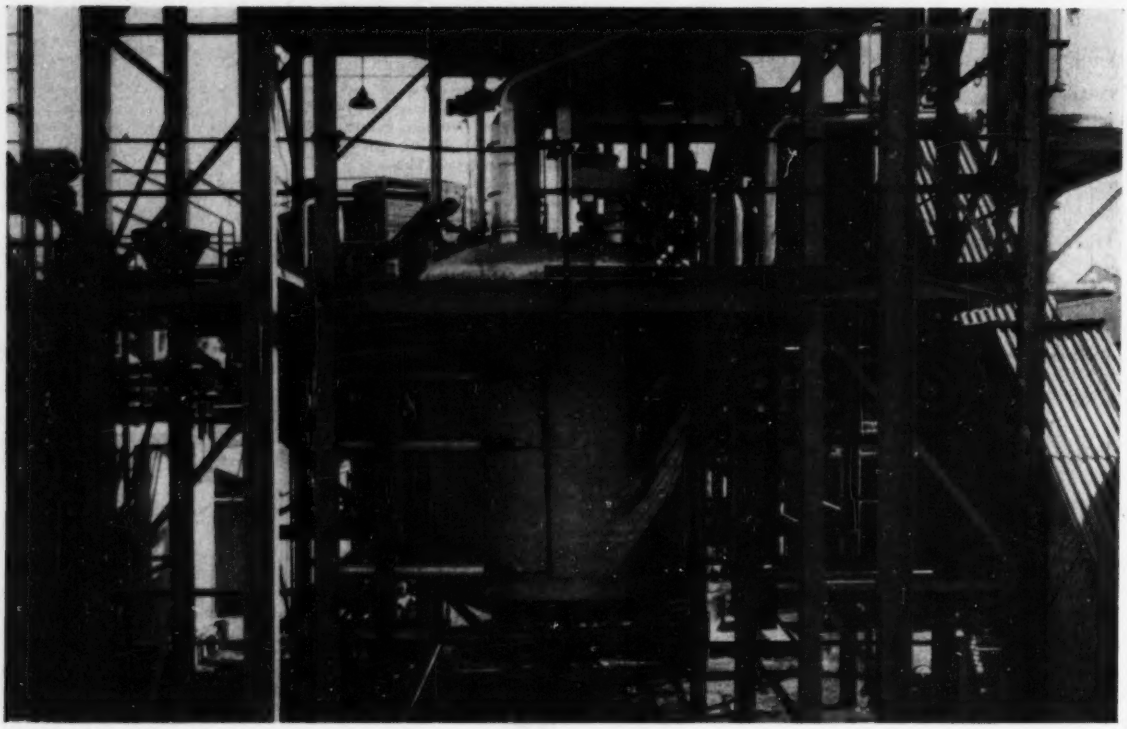
PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Cold rubber	Oil master-batch	Various	Cold rubber is extended by admixture of latex with 25 percent of cheap petroleum-base oil in water emulsion.	Extends cold rubber capacity 25 percent without impairing quality; also lowers cost 4c./lb.
Cold rubber	Pipeline reactor	B. F. Goodrich Chemical Akron, Ohio	Fast-acting catalyst and rapid heat transfer in pipeline reactor cut polymerization time to 15 min. instead of usual 10–12 hr.	750-lb./day pilot plant in operation, using 250 ft. of ½-in. pipe.
Cold rubber	Polymerization	B. F. Goodrich Chemical Port Neches, Tex.	Reaction time cut from 13 to 9 hr. using new water treatment to form complex ions.	Less exact control now required.

RUBBER (Cont'd)

PRODUCT	PROCESS	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Cold rubber	Rosin addition	U. S. Rubber Co., Naugatuck, Conn.	Rosin chemicals added to extra-tough cold GR-S makes product 30-50 percent more abrasion-resistant than standard cold rubber. More resistant to heat and flex-cracking.	In pilot plant late 1952.
Ebonite	Latex derived		Black vulcanized hard rubber made directly from latex. Bypasses dry processing, competitive with resin.	Developed in Holland.
Fluoro-rubbers	Synthesis	Minnesota Mining & Mfg. Hastings, Minn.	Butyric acid converted in Simons cell to perfluorobutyric acid, which is esterified, reduced, esterified and polymerized to rubber-like plastic.	Resistant to temperature, impervious to ozone, fuels, most solvents. Limited initial production.
Polybutadiene rubber	Polymerization	Goodyear Tire & Rubber Akron, Ohio	Cold process polybutadiene developed to eliminate odor in foam-rubber.	In pilot-plant stage as of April 1952.
Polyester rubber	Controlled polymerization	Goodyear Tire & Rubber Akron, Ohio	Ethylene and propylene glycols polymerized with adipic acid; reaction controlled with di-isocyanates. Product can be processed on conventional rubber machinery.	Still undergoing research; promising prospects for tough tire treads.
Reclaimed rubber	Powder	Mid-West Rubber Reclaiming Co. East St. Louis, Ill.	Rubber produced in powdered form offers several advantages for ease of compounding and automatic handling.	Recently developed as replacement for conventional slab reclaimed rubber.
Silicone rubber	Compounding	Connecticut Hard Rubber New Haven, Conn.	Hydrophobic silica reinforces silicone rubber and acts as vulcanising agent; produces very high tensile strength.	
Synthetic rubber, GR-S	Carbon black dispersion	Copolymer Corp. Baton Rouge, La.	Steam jet used to disperse carbon black in latex. Eliminates wetting agents, gives tougher rubber.	Pilot-plant operation.
Synthetic rubber, GR-S	"Hot" polymerization	Firestone Tire and Rubber Akron, Ohio	Nitrasole CF catalyst gives abrasion-resistant product at 122 deg. F., eliminates need for refrigeration equipment.	
Synthetic rubber, GR-S	Polymerization	B. F. Goodrich Chemical Institute, W. Va.	Catalytic mixture contains cumene hydroperoxide, dextrose and T.S.P. Speeds up production of hot rubber 35 percent.	Developed by RFC-financed research.

MISCELLANEOUS TECHNOLOGY

OPERATION	EQUIPMENT	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Atomic energy	Breeder reactor	Atomic Energy Commission Idaho Falls, Ida.	Liquid metal transfers breeder reactor heat to steam generating exchanger, producing steam to drive turbine.	Initial step of experimental stage.
Atomic energy	Chain reactor	Univ. of California, Los Alamos, N. M.	Smallest and most economical chain reactor thus far constructed. Water used as cooler and moderator.	In operation.
Atomic energy	Homogeneous reactor	Union Carbide and Carbon Oak Ridge, Tenn.	First successful production of electric power at a temperature and pressure high enough to run a standard turbine-generator.	Reactor has been brought up to full design power of 1,000 kw. output.
Atomic energy	Power reactor	Atomic Energy Commission Probably Ohio or Kentucky	AEC has announced that design and building of a 60,000-kw. atomic power plant will be undertaken for electric power production. Plutonium will not be made.	Westinghouse will be prime contractor on this project. Design probably will be similar to that of submarine propulsion reactor.
Coal gasification	Cyclone chamber	Ruhrgas A. G., Essen, Germany	Process yields 490-Btu. producer gas from pulverized bituminous coal and lignite by gasifying in a vortex or cyclone chamber with air blast preheated to 1,100 deg. F. and liquid slag removal.	Process now in use, said to give better results on low-grade fuels than conventional gas producers.
Coal gasification	Pulse-jet producer	Ruhrgas A. G., Essen, Germany	Experimental coal gasification process uses preheated air and finely ground low-grade coal, mixed in pulse-jet type gasification chamber.	Results indicate gasification efficiencies around 63 percent and heating values around 107 Btu./cu.ft., using air to gasify.
Deionization	Ionic membranes		Compartmented cell containing a number of synthetic membranes and a pair of electrodes continuously separates ionic solutes from two-thirds of hard or seawater feed, discharging solutes in remaining one-third.	Claimed to operate for 10-20c./1,000 gal. on seawater, less on brackish waters. Being developed by Ionics, Inc., Rohm & Haas, possibly others. Hooker Electrochemical Co. is working on use in caustic-chlorine cells.
Dispersion	Film mill	Various	V-ring rotates in stator with semisolid feed forced through space between ring and stator under high pressure.	Developed by Micro Processing Equipment, Inc. Used for milling soaps and materials of similar consistency.
Distillation	Kittel tray		Metal plate is perforated by expanded metal fabricating techniques. Capacity 30-50 percent greater than bubble trays.	German development. Can be made in a variety of metals.
Distillation	Turbogrid tray	Shell Oil Co., Shell Chemical, others.	Tray consisting of parallel grid bars gives 20-100 percent higher column capacity, longer life, lower first cost compared with bubble trays	Developed by Shell Development Co. Available under license.



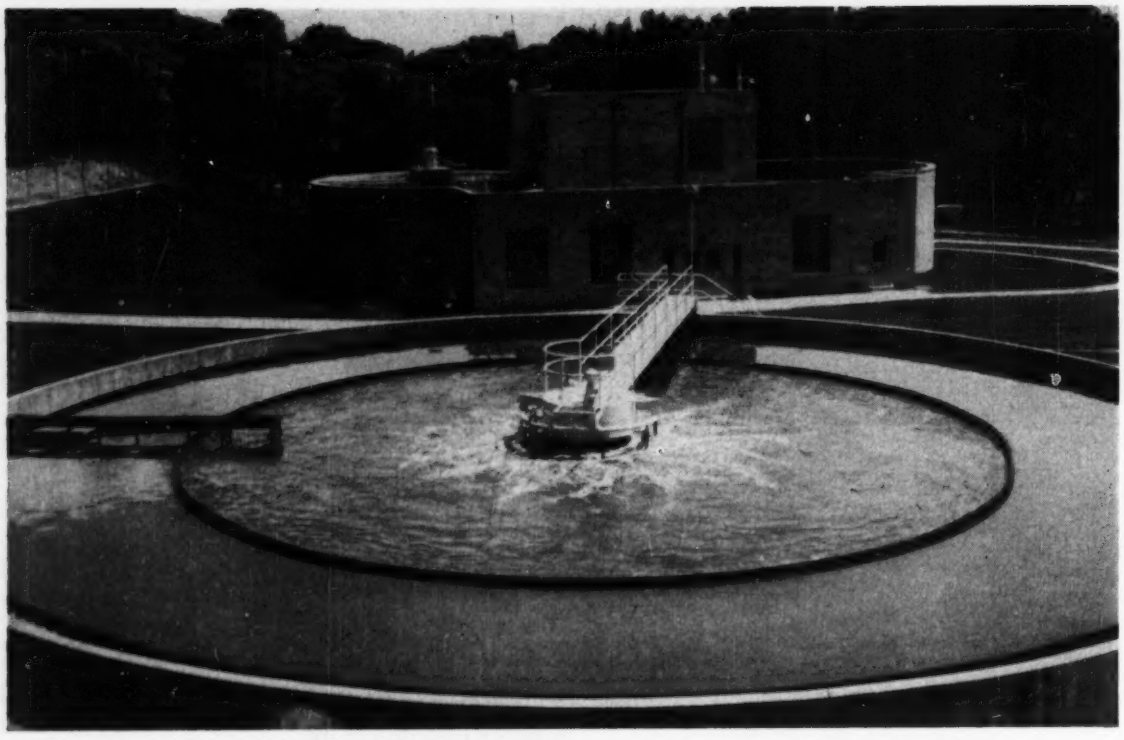
SYNTHETIC RESINS—Reichhold's large outdoor kettle installation at Elizabeth, N. J., is being watched for performance during winter.

MISCELLANEOUS TECHNOLOGY (Cont'd)

OPERATION	EQUIPMENT	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Dust recovery	Wet-bottom precipitator	Various	Wet-bottom Cottrell electrostatic precipitators will recover salt cake dust at 90 percent efficiency from 140,000 cfm. of black-ash furnace gases at 275-300 deg. F.	Black liquor pumped through bottom sump removes collected dust.
Emulsification	Gallenkamp mixer		Produces stable emulsions and suspensions by high-speed, razor-edged blades.	Under investigation by several industries.
Energy production	Engine-turbine		Free-piston gas engine discharges hot gases to gas turbine. Thermodynamic efficiency is greater than rotary compressor-turbine units, equal to diesels.	Developed by Cooper-Bessemer Corp.
Evaporation	High-vacuum concentrator	Various	Corrosion and scale problems are greatly reduced in falling-film concentrator operating at 6-15 mm. Hg abs.	Developed by Carrier Corp. Used for citrus juices, applicable to caustic soda, $MgCl_2$, etc. (See Phosphoric Acid.)
Extractive crystallization			Urea and thiourea adducts simplify separation of close-boiling organic compounds. Adduct crystals are filtered, then dissolved in water, destroying the complex.	Research in progress by Shell Oil Co. and others.
Fire fighting	Air agitation	Socony-Vacuum Oil Co., Paulsboro, N. J.	Fire in volatile liquids can be snuffed out or reduced to fightable size by air agitation which brings cold liquid to top, stops vaporization.	Method, available on royalty-free basis, works on petroleum products, vegetable oils.
Flow measurement	Mass flowmeter	Various	Measures mass flow directly, using coriolis effect. Works with any fluid or solid-fluid mixture, independent of temperature, pressure, viscosity.	Being developed by Control Engineering Corp., Norwood, Mass.
Freeze drying	Infrared, continuous		Liquid frozen as pellets, then dried under vacuum by infrared on continuous belt. Much faster than batch processes.	Developed by Freeze-Dry Corp. and Proctor & Schwartz for heat-sensitive organics, pharmaceuticals, foods.
Gas-phase reactions	Jet reactor	Various	Developed as a high-velocity fluid fuel burner, jet device gives complete combustion, near-theoretical temperatures, enormous heat release.	Burner being tried out by various chemical concerns for uses such as synthesis gas production, drying, evaporation, acetylene from natural gas. Developed by Thermal Research & Eng. Corp.
Grinding	Any type		New theory of work in grinding states that work useful in breakage is proportional to square root of diameter of product particles. Permits workable predictions.	Developed by F. C. Bond of Allis-Chalmers, new "Third Theory" supplements Kick and Rittinger theories of grinding work.

MISCELLANEOUS TECHNOLOGY (Cont'd)

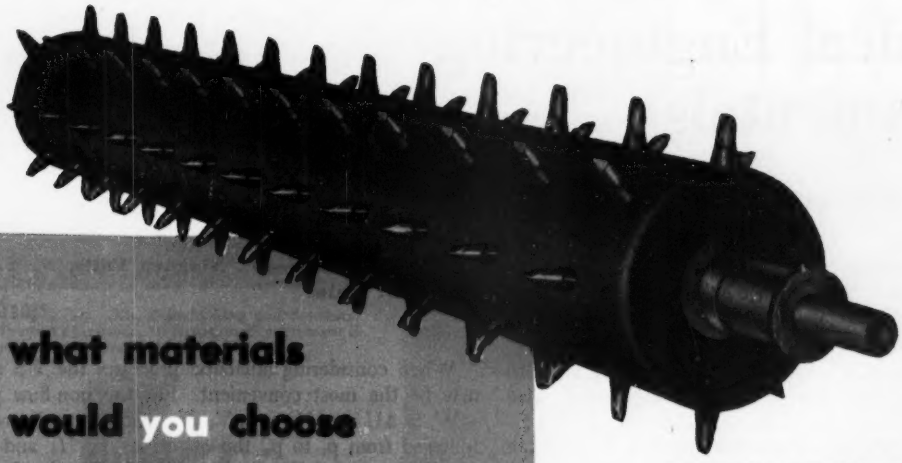
OPERATION	EQUIPMENT	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Heat exchange	Rotary kilns	Various	Several new devices recently introduced get more efficient use of fuel in calcining operations by better dispersion of solids in hot gases.	
Ink drying	Sulfur dichloride contactor	Meyercord Co., Chicago, Ill.	Speeds drying of inks, paints and varnishes by exposure to sulfur dichloride vapor.	Developed by Armour Research Foundation.
Ion exchange	Regeneration	National Aluminate Corp., Chicago, Ill.	Sulfuric acid regeneration of high-capacity polystyrene cation exchangers is done stepwise with increasing concentrations of acid to avoid precipitation of calcium sulfate.	
Ion exclusion	Ion exchange column	Dow Chemical Co., Midland, Mich.	Separates ionic from nonionic materials. Ordinary ion-exchange resins reject ionic material, slow down nonionic. Periodic water wash removes ionic materials in solution ahead of nonionic.	Developed by Dow, process is expected to supplement ion exchange in applications where concentration of ionic material is high. Regenerant chemicals not needed. 70 gph. unit operating.
Liquid-liquid extraction	Mixer-settler	General Electric Co., Schenectady, N. Y.	Extractor consists of a number of stages, each stage having a mixing and a settling section. Shaft-driven impeller produces mixing of light and heavy phases in mixing section. Pumping action of impeller eliminates tilting and large hold-up.	Developed for Knolls Atomic Power Laboratory of AEC. Pilot-plant unit is in operation.
Liquid-liquid extraction	Pulse column	Various	Mechanical pulsation of column contents increases throughput and efficiency. Pulsations are usually in the frequency range of 10 to 100 per min. and 0.1 to 1 in. in amplitude.	Much of this work is classified (AEC).
Liquid transfer	Sealless pump		Centrifugal pump and motor integrated as a submerged unit, with stainless diaphragm between stator and rotor.	Commercially available from Peerless Pump Div., Los Angeles.
Mechanical separations	Gas cyclone		Machine has conventional tangential inlet, but entrance velocity is accelerated by rotation of a perforated rotor. High efficiency on small particles.	Mfd. by Superior Separator Co., Hopkins, Minn.
Mechanical separations	Liquid cyclone		New design liquid cyclone contains built-in impeller to give greater centrifugal force for separating suspended solids by size.	Developed by Equipment Engineers, San Francisco. Offered as Centriclone by Oliver United Filters.
Monitoring gas streams	Nondispersive infrared analyzers	Various	Analyzers of positive and negative filter types, made by several makers, can continuously measure concentration of one component in up to 12 or more.	"Plant-stream analyzers" just now becoming popular, chiefly for gas streams, both organic and inorganic. Liquid-stream analysis coming.
Odor control	Catalytic combustion	Sun Oil Co., others, Marcus Hook, Pa.	Porcelain rods coated with alumina-Pt alloy catalyst claimed 90 percent or better efficient in oxidizing organic odors, recovering waste heat.	Developed by E. J. Houdry; marketed by Oxy-Catalyst Mfg. Co. Sun Oil recovering 7,500,000 Btu./hr. from waste 3 percent CO and hydrocarbons.
Odor control	Spray scrubber	Various	Organic odors destroyed by contact with water spray containing 100–500 ppm. of chlorine as chlorine dioxide.	More effective than chlorine or hypochlorite. Developed by Mathieson Chemical Co.
Odor measurement	Odor threshold instrument	Procter & Gamble Co., Ivorydale, Ohio	Device measures odor detection threshold by mixing known ratios of purified air with sample.	Instrument not patented so can be built and used by anyone.
Power generation	Fuel cell	Pittsburgh Consolidation Coal Co. Library, Pa.	Converts carbon directly to low-voltage electrical energy, bypassing conventional steam cycle. Potential over-all efficiency 80 percent.	Pilot unit under test, economics as yet undetermined.
Power recovery	Turbo-expander	Mississippi Chemical Co., others Yazoo City, Miss.	Pressure of waste gas from nitric acid plant will be recovered by compressor-expander. About 75 percent of the power needed for compression will be recovered.	Cost of turbo-expander will be paid out in four years.
Resisting heat	New refractory		Refractory of silicon carbide bonded with silicon nitride withstands 5,000 deg. F. and 300 psi. for short time in rocket motors.	Called Niafrax; developed by Carborundum Co. Expect similar compositions to have important process uses, e.g., in oil and gas cracking.
Soil compaction	Vibrator	International Minerals & Chemical Corp., Mulberry, Fla., others	Vibrafloat method, involving intense vibration of soil in presence of water, being pioneered for industrial soil preparation in U. S. by Intminco. On sandy soil compacts soil for foundations at ¼ cost of piles.	Developed by S. Steuerman, operated by Rust Engineering Co. Mulberry plant, built on sand over 3,350 compacted spots, shows no settlement.
Soil stabilization	Lignin oxidation	Army Engineer Corps	Sulfite liquor reacts with Na or K bichromate to form water-insoluble gel.	Developed by Cornell Univ. Undergoing application tests by Army.
Solidification	Tube molding	Various	Tube-Ice machine now being applied to solidification of chemicals such as p-dichlorobenzene, maleic anhydride.	Machines made by Henry Vogt Mach. Co., Louisville.
Solids handling	Gas lift	Union Oil Co., Wilmington, Calif.	New Hyperflow process for moving solids, e.g. catalysts, through pipes uses dense-phase gas lift in nonfluidized form. Claimed to minimize attrition.	Developed by Union Oil for lifting pelleted catalysts as high as 300 ft. at extremes of temperature and pressure. Now in use on Hyperforming and contact coking installations.



WASTE DISPOSAL—Bacterial digestion of brewery wastes at 130 deg. F. speeds up treatment, uses smaller equipment.

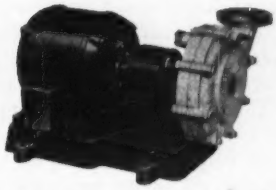
MISCELLANEOUS TECHNOLOGY

OPERATION	EQUIPMENT	USER AND LOCATION	FEATURES	STATUS AND REMARKS
Vacuum distilling	Heated-tray still	A. Gross & Co., others, Newark, N. J.	Vacuum still for fatty acids decreases temperature-time exposure by using hollow, Dowtherm-heated bubble trays. Gives higher yield, high product quality.	First unit tried out several years ago. Other installations now going in Developed by Wurster & Sanger, Inc., Chicago.
Vapor drying	Pressure-vacuum	Taylor-Colquitt Co. Spartanburg, S. C.	After pressure impregnation of wood with pentachlorophenol the solvent is removed by a vapor drying process. Savings result from recovery of solvent, and migration of preservative to surface is avoided.	Treating costs have been reduced as much as 56 percent.
Waste disposal	Air flotation	Various	Air dissolved under 25 psi. pressure in waste water containing fine solids or immiscible liquids is released, bubbling to surface and carrying contaminants, clarifying water.	Developed by Bulkley, Dunton Processes, Inc., under name of Colloidair.
Waste disposal	Biological action	City of Houston, others Houston, Tex.	Bacterial strains added to sewage accelerate digestion, improve flocculation, cut capital costs. Strains available for various types of industrial waste.	Still in trial stage. Bacteria marketed by Reliance Chemicals Corp., Houston. Several petroleum and chemical companies have shown interest.
Waste disposal	Phosphorus removal	Oldbury Electro-Chemical Co. Niagara Falls, N. Y.	Waste water containing phosphorus is treated with chlorine, forming phosphorus trichloride which hydrolyzes to acid.	Eliminates hazards in sewage treatment plant.
Waste disposal	Solvent extractor	Ohio Oil Co. Robinson, Ill.	Hydrocarbon solvent removes phenol from process wastes. Uses Scheibel extractor.	Process worked out in laboratory.
Waste disposal	Thermophylic digestion	Coors Brewing Co. Golden, Colo.	Plant effluent is treated by oxidation, digestion at 130 deg. F., pressure flotation. Result is smaller equipment, shorter treatment time and lower cost.	Operation started summer 1953. First such process used in U. S.
Waste disposal	Vacuum filters		Iron or aluminum sulfate flocculating followed by slow freezing and thawing improves sewage sludge filterability.	English development.
Water treatment	Packed tower	Freeport Sulphur Co. Bay Ste. Elaine, La.	Amphibious sulfur mining plant uses brackish injection water. Corrosiveness controlled by scrubbing with flue gas to remove oxygen.	Scale deposition is minimized in heating water to 325 deg. in heat exchangers by use of controlled heating conditions.
Water treatment	Reuse of sewage effluent	Cosden Petroleum Co. Big Spring, Tex.	Refinery water supplied by sewage effluent from municipal treatment plant. Quality better than scale-forming well water.	In operation.



what materials would you choose for these CORROSION problems?

1 Teeth of this shredder roll for the paper industry are hard, corrosion resistant alloy. It handles sulphite liquor and bleach. Problem: How to make the *drum* corrosion resistant at least cost?



2 Machine for washing television tubes needed four pumps to handle 12% hydrofluoric acid cleansing reagent. What kind of a pump would *you* try first on this job?

3 Tube sheet nearly 6 ft. dia. handles *hot* chlorine gas at 180 deg. F. It is assembled with glass tube in a gas cooler, must remain rigid, must not warp. Any ideas?

1 Shredder roll is steel covered with hard rubber. Though the teeth are covered only half-way to their tips, the indestructible Ace bond keeps acids from working down to the steel roll under the lining. Soft-rubber covered agitators over 32 ft. long are also at work in this paper plant.

2 Standard Ace W.A.M. centrifugal pump with chemical-resistant hard rubber casing and impeller is ideal for acids. On this tube washing machine it turns on and off every 30 seconds. Can you think of a tougher test for a good pump?

3 A new heat resistant hard rubber compound was used for this tube sheet. The 1237 holes were drilled in 1" sheet, and chamfered to facilitate fitting the glass tubes. It's a good example of parts *you* can make from Ace hard rubber, synthetic rubber or plastic sheet, rod and tube.

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Chemical Engineering Fundamentals

CE REFRESHER

Compression and Expansion—II

THOMAS E. CORRIGAN, Research Engineer, Mathieson Chemical Corp., Niagara Falls, N. Y.
A. F. JOHNSON, Sales Engineer, Carrier Corp., Cleveland, Ohio

In the compression work calculations discussed up to now, we assumed that the process was either isothermal or adiabatic (*Chem. Eng.*, Dec. 1953, pp. 211-216). Actually the process lies somewhere between the two, although it may approach either one quite closely, in some cases.

The Polytropic Process

In the polytropic process (neither adiabatic nor isothermal), we do not have the fortunate case of either the dS or dT terms dropping out of the equation. Therefore a simple thermodynamically rigorous expression is not possible. We could evaluate either $\int V dp$ or $\int p dV$ by graphical integration, but this would require the use of p-V-T data along the path of the compression. For this reason empirical equations based on ideal gas behavior, but containing empirical constants, are used. These equations are reliable except for extremely high pressure calculations in which deviations from ideality are fairly large. Edmister developed a method whereby he uses an empirical exponent that can be evaluated from a prepared chart. For more details on this we refer you to the original articles.[1]

Applications of the method using the empirical constant will be presented here.

Use of Thermodynamic Charts to Calculate Work

We will present methods for calculating the work of compression of non-ideal gases for the general case where there are no prepared diagrams. For the few substances for which enthalpy-temperature, entropy-temperature, and enthalpy-entropy diagrams are available, the calculation of work of compression is very much simplified. The energy relations are used and read directly from the charts.

Let's consider the isothermal process first. For non-flow work, $-W = \Delta A$. Since A is seldom used on the charts, we shall use the expression, $\Delta A = \Delta H - \Delta pV - T\Delta S$. Here ΔH may be read directly from the H-T diagram by following the constant T line from p_1 to p_2. ΔS may be evaluated in the same way from the S-T diagram (or from the H-T diagram also, if it shows constant S lines). If the H-T or S-T diagrams contain constant volume lines, as most do, V_2 may be read from the chart at p_2 and the quantity $(p_2V_2 - p_1V_1)$ can be evaluated. We could also use an H-S diagram (Mollier chart) since it contains lines of constant volume, pressure and temperature.

For isothermal flow work, $-W = \Delta G = \Delta H - T\Delta S$. Both ΔH and ΔS may be evaluated by following the constant temperature line from p_1 to p_2 and reading off H_2 and S_2 on any of the three kinds of diagram.

When considering adiabatic processes the T-S diagram may be the most convenient. For the non-flow process, $-W = \Delta U = \Delta H - \Delta pV$. If a constant entropy line is followed from p_1 to p_2, the quantities T_2, H_2, and V_2 can be calculated and the work evaluated. For the flow process, $-W = \Delta H$. This may be read directly from the vertical, constant entropy line on an H-S chart.

Thermodynamic Chart Problems

Example—Calculate the theoretical horsepower required to compress 1 ton per hr. of ammonia from an initial pressure of 15 psia., and initial temperature of 100 deg. F, to a final pressure of 100 psia. under the following conditions:

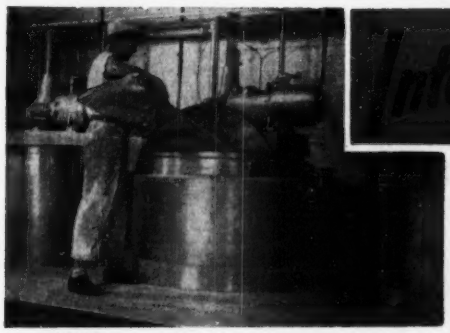
(a) Non-flow isothermal
(b) Flow isothermal
(c) Non-flow adiabatic
(d) Flow adiabatic
(e) In a two-stage flow process compression with intercooling

Solution—Fig. 1 is an entropy-temperature diagram for ammonia. It contains enthalpy and pressure values as parameters. Fig. 2 is a pressure-volume chart for ammonia. These two charts will be used as far as possible in the solution of these problems.

(a) *Non-flow isothermal*—The expression for non-flow work is $dW = pdV$, and since the process is isothermal,

NOMENCLATURE (Consistent Units)

A	Total work function
d	Differential operator
g	Gravitational constant
G	Free energy (net work function)
H	Enthalpy
H_i	Interstage enthalpy
H_{ic}	Enthalpy of intercooling
p	Pressure
p_c	Critical pressure
p_i	Interstage pressure
R	Universal gas constant
S	Entropy
t_c	Critical temperature
T	Absolute temperature, deg. K. or R.
T_i	Interstage temperature
u	Velocity of flow
U	Internal energy
V	Volume
W	Work
z	Compressibility factor
Z	Potential energy
∂	Partial differential operator
Δ	Finite change in a property
ϕ	Function of



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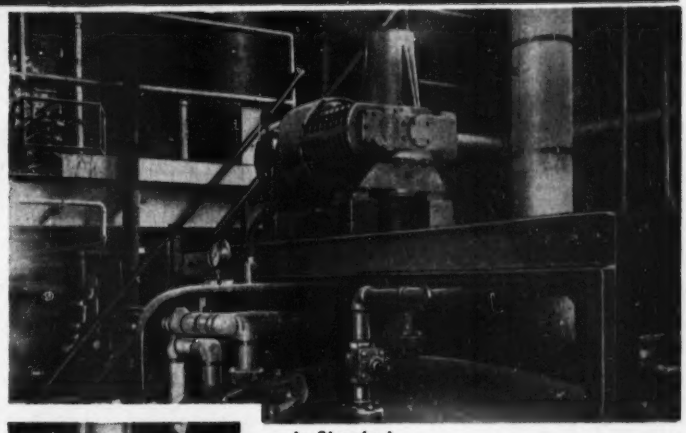

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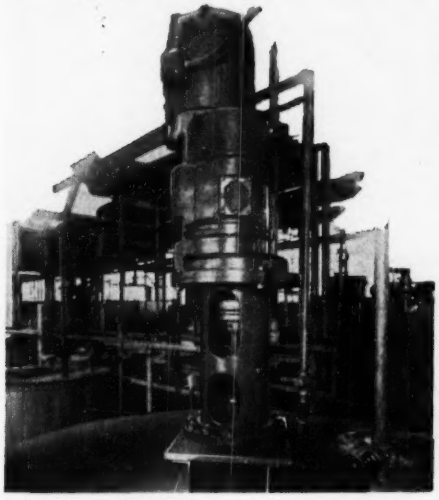

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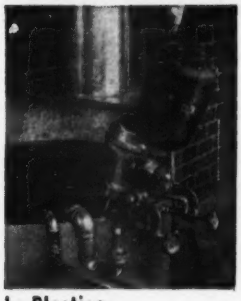

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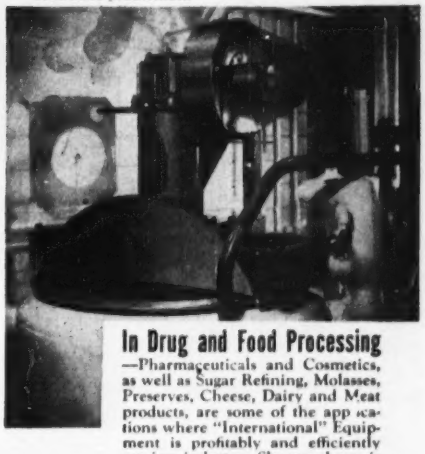

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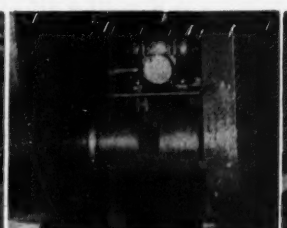

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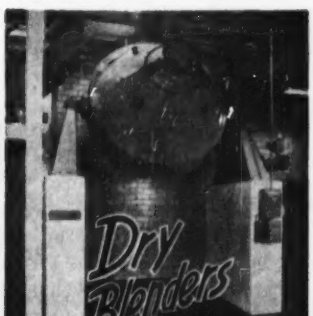

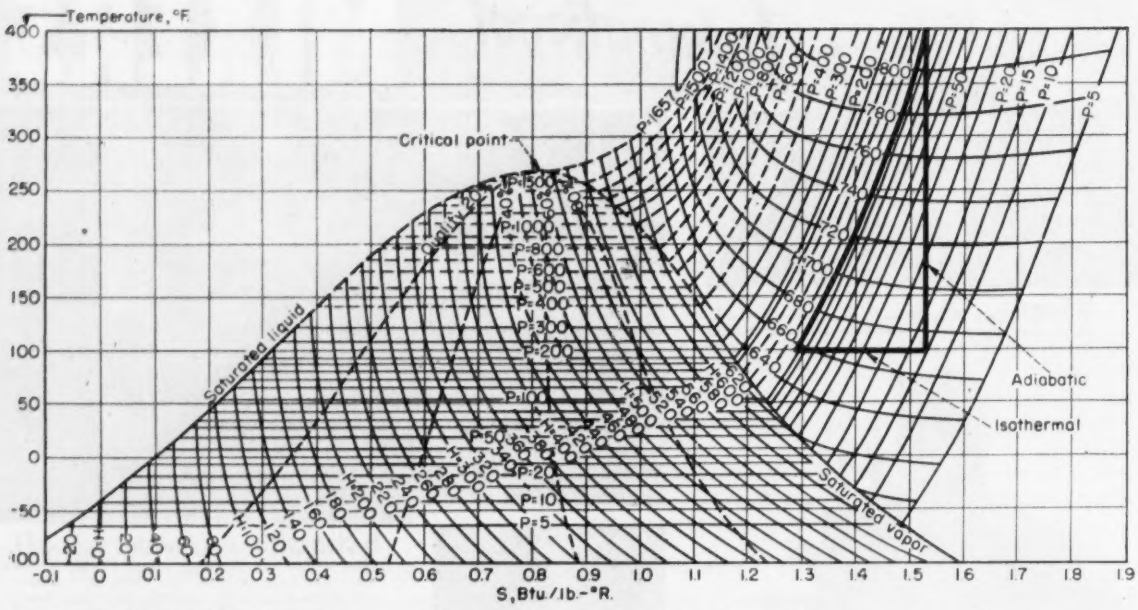

Fig. 1—ENTROPY-TEMPERATURE diagrams help to solve compression work problems. This one is for ammonia.

$dT = 0$. Therefore, we must use a differential energy equation which involves both dT and pdV. The one to use is:

$$dA = -SdT - pdV$$

Since dT is equal to zero,

$$dA = -pdV$$

$$-W = -\int pdV = \Delta A$$

It would be convenient if values of A were shown as a parameter on Fig. 1. Since they aren't, we must improvise:

$$\Delta A = \Delta U - \Delta (TS)$$

or, for the isothermal case

$$\Delta A = \Delta U - T\Delta S$$

But there are no values of U on Fig. 1 either. However,

$$\Delta U = \Delta H - \Delta (pV)$$

and so,

$$\Delta A = \Delta H - \Delta pV - T\Delta S$$

The values of ΔH and ΔS can be calculated from Fig. 1. We will have to evaluate ΔpV elsewhere.

On Fig. 1, locate the $p = 15$ parameter and follow it to the point where it intersects the 100 deg. F. line. The entropy at this point is 1.53 Btu./lb.-deg. R. The enthalpy can be estimated at 670 Btu./lb. from the enthalpy parameters. Follow the 100 deg. F. line to the left until it crosses the 100 psia. line. Here the value of entropy is 1.29 Btu./lb.-deg. F., and the value of enthalpy may be estimated as 655 Btu./lb. We now have the following values:

$\Delta H = 655 - 670 = -15$ Btu./lb.

$\Delta S = 1.29 - 1.53 = -0.24$ Btu./lb.-deg. R.

$T = 100$ °F. $= 560$ °R.

There are two possible ways of evaluating $\Delta(pV)$. One is to use $p_2V_2 - p_1V_1$, and evaluate the specific volume at p_1 and p_2. This would call for either a pressure-volume chart or for constant volume lines on Fig. 1. The other method is to use $\Delta(pV) = \Delta(zRT)$, or $\Delta(pV) = RT(\Delta z)$. This would call for either a specific z chart for ammonia or for the values of t_c and p_c, to be used with a generalized z chart.

From Fig. 2, at 100 deg. F. and 15 psia., V = 23 cu. ft./lb., and at 100 deg. F. and 100 psia., V = 3.3 cu. ft./lb. Therefore,

$p_1V_1 = (15/14.7)\ (23) = 23.4$

$p_2V_2 = (100/14.7)\ (3.3) = 22.4$

$\Delta pV = -1.0$ cu. ft.-atm./lb.

$\Delta pV = -2.72$ Btu./lb.

$-W = \Delta H - \Delta (pV) - T\Delta S$

$= -15$ Btu./lb. $-(-2.72$ Btu./lb.$) -$ (560°R.) $(-0.24$ Btu./lb.-°R.)

$= -15 + 2.72 + 134.5 = 122.2$ Btu./lb.

$= 0.0480$ hp.-hr./lb.

$= 2{,}000\ (0.0480) = 96.0$ hp.

In this case the major contribution was the entropy change.

(*b*) *Flow isothermal*—Here the work is $dW = Vdp$, and since the process is isothermal, $dT = 0$. We may use the expression:

$$dG = -SdT + Vdp$$

And,

$$-dW = Vdp = dG$$

$$-W = \Delta G$$

Since there are no constant G lines on Fig. 1, we will use $\Delta G = \Delta H - T\Delta S$. Thus from part (a),

$-W = \Delta G = \Delta H - T\Delta S$

$= -15 - (560)\ (-0.24)$

$= -15 + 134.5 = 119.5$ Btu./lb.

$= 0.0470$ hp.-hr./lb.

$= 0.0470\ (2000) = 94$ hp.

Here the difference between the flow and the non-flow case is negligible.

(*c*) *Non-flow adiabatic*—Here the process is isentropic and so $dS = 0$. Work is $dW = pdV$. An expression involving both dS and pdV is $dU = TdS - pdV$.

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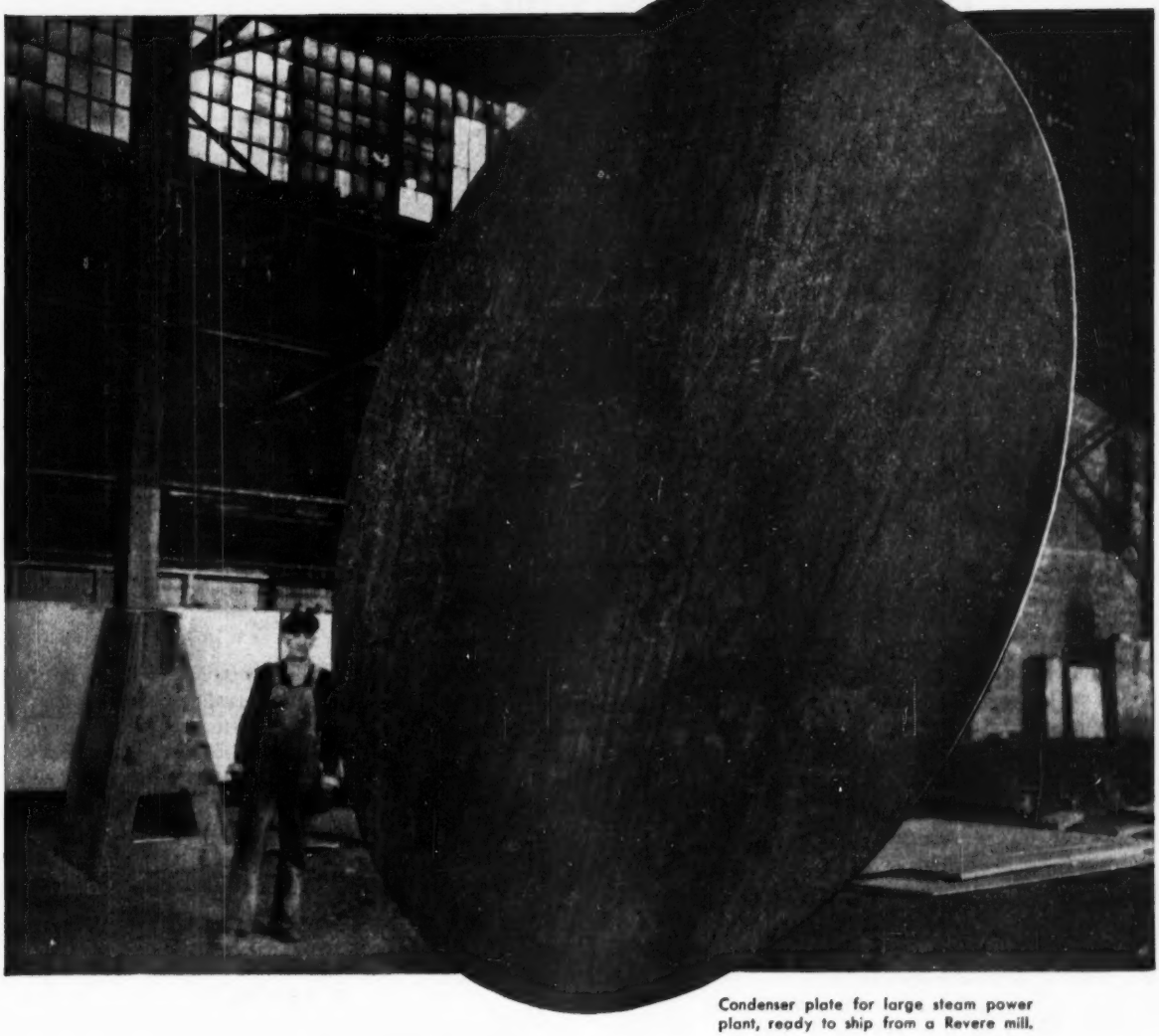

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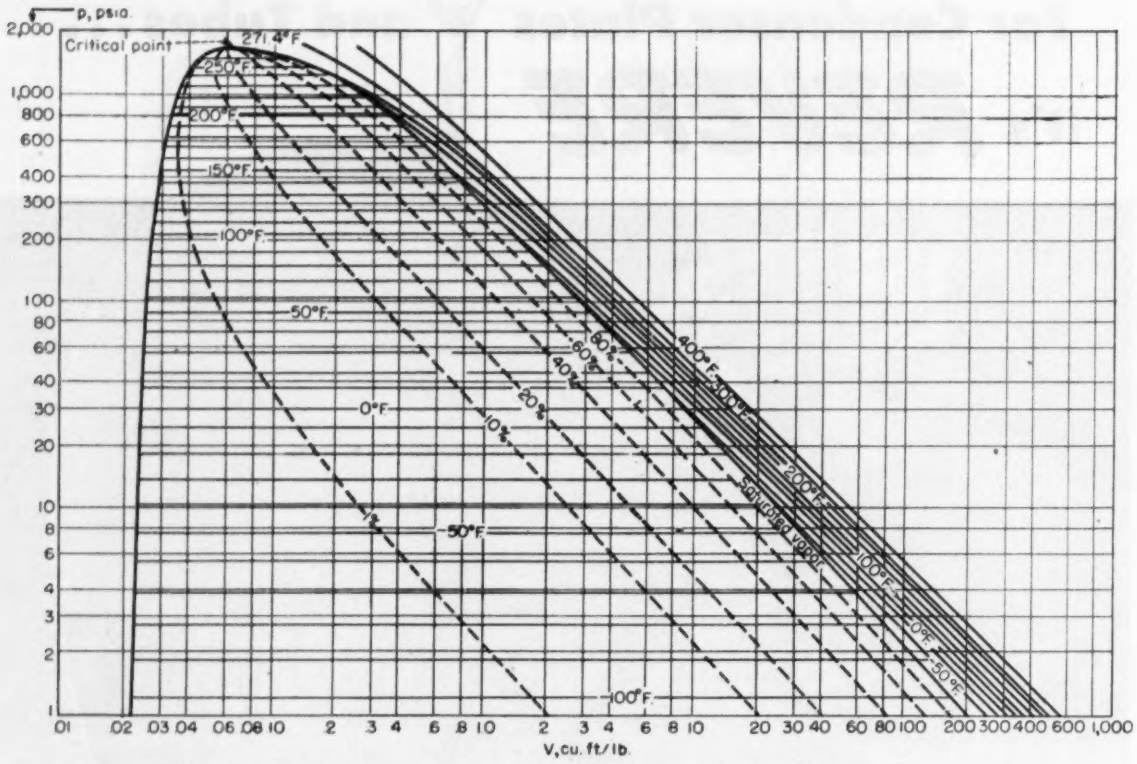

Fig. 2—PRESSURE-VOLUME chart for ammonia. Data are from Natl. Bur. of Stds. Circ. No. 142.

Fig. 1 does not show internal energy as a parameter, so we will use,

$$\Delta H = \Delta U + \Delta (pV) - W = \Delta U = \Delta H - \Delta pV$$

The initial conditions have been located in part (a) at the point where $p = 15$ psia. and $T = 100$ deg. F. Also.

$$\Delta H = 670 \text{ Btu./lb.}$$
$$p_1V_1 = 23.4$$

Since the compression is isentropic, follow the constant entropy ($S = 1.53$) line on Fig. 1 to the point where it intersects the 100 psia. pressure line. At this point,

$$T = 395 \text{ °F.}$$
$$H = 900 \text{ Btu./lb.}$$
$$\Delta H = 900 - 670 = 230 \text{ Btu./lb.}$$

From Fig. 2, at $T = 395$ deg. F. and $p = 100$ psia.,

$$V = 5.3 \text{ cu. ft./lb.}$$
$$\Delta(pV) = p_2V_2 - p_1V_1$$
$$= (100/14.7)\ (5.3) - 23.4 = 36.2 - 23.4$$
$$= 12.8 \text{ cu. ft.-atm.} = 34.4 \text{ Btu./lb.}$$
$$-W = \Delta H - \Delta(pV) = 230 - 34.4 = 195.6 \text{ Btu./lb.}$$
$$= 0.0771 \text{ hp.-hr./lb.}$$
$$= 2{,}000\ (0.0771) = 154.2 \text{ hp.}$$

(d) Adiabatic flow process—Here $dW = Vdp$ and $dS = 0$. Since $dH = TdS + Vdp$, $-W = \int Vdp = dH$. From Fig. 1, $H_1 = 670$ Btu./lb. Follow the constant entropy line to 100 psia. where:

$$H = 900 \text{ Btu./lb. (approx.)}$$
$$-W = \Delta H = 230 \text{ Btu./lb.}$$
$$-W = 0.0905 \text{ hp.-hr./lb.}$$
$$= 0.0905\ (2000) = 181 \text{ hp.}$$

(e) Two-stage compression with intercooling—On the *T-S* diagram, the isothermal and adiabatic cases represent paths which are at right angles to each other. The expanded section is shown in Fig. 3.

Usually in a two-stage compression the intermediate pressure, p_i, is chosen so that $p_2/p_i = p_i/p_1$. Therefore,

$$100/p_i = p_i/15$$
$$p_i = \sqrt{1{,}500} = 40 \text{ psia. (approx.)}$$

The first stage is an adiabatic compression from 15 to 40 psia. On Fig. 1, follow the constant entropy line from 15 psia. to 40 psia. Here

$$T_i = 240 \text{ °F.}$$
$$H_i = 740 \text{ Btu./lb.}$$

Since the compression is flow adiabatic, $dS = 0$, and $-W = Vdp$. But $dH = TdS + Vdp$. Therefore,

$$-W = \Delta H = 740 - 670$$
$$= 70 \text{ Btu./lb.}$$

During the interstage cooling the gas is cooled from 240 deg. F. back to 100 deg. F. at 40 psia. The interstage temperature is usually taken as about 10 deg. F. higher than the available cooling water temperature. The fact that it is the same as the inlet gas temperature in this example is coincidence. No work is done during the cooling step.

In the second stage the gas is compressed adiabatically from 40 psia. to 100 psia. Follow the constant entropy line from 40 psia. and 100 deg. F., to 100 psia.

$$S_i = 1.49$$
$$H_2 = 668 \text{ Btu./lb. (approx.)}$$

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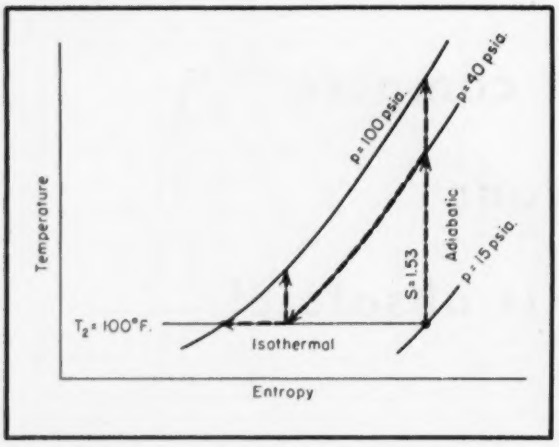

Fig. 3—Two-stage compression. One of many paths.

$H_3 = 730$

$-W_s = \Delta H = H_3 - H_4 = 730 - 668 = 62$ Btu./lb.

For both stages,

$-W = 70 + 62 = 132$ Btu./lb.

$-W = 0.0519$ hp.-hr./lb.

$= 0.0519\ (2000) = 103.8$ hp.

Construction of Thermodynamic Charts

We will not go into the construction of thermodynamic diagrams here. The standard textbooks on chemical engineering thermodynamics,[1, 2, 4] all give explanations of the procedure. Basically the charts are built up by determining two or more thermodynamic properties over a wide experimental range. Then these values are used to calculate and cross-plot.

Applications of Expansion

The thermodynamics of compression processes is of interest to engineers because it enables them to calculate the amount of mechanical energy needed to compress a gas. In the same way, the thermodynamics of expansion processes is of interest because it helps the engineer to calculate energy effects in industrial processes which depend upon the expansion of a gas.

There are several industrial applications which depend on expanding gases. They fall into two major classes. (1) production of mechanical work, and (2) refrigeration. Under the first grouping we have the reciprocating steam engine, the steam turbine, internal combustion engines, and gas turbines. The reciprocating steam engine and the steam turbine involve physical expansion only and may be considered the reverse of reciprocating and centrifugal compressors.

In the internal combustion engine and the gas turbine, mechanical work is generated from expanding gases; but the gases expand because of volume and temperature increases caused by chemical reactions. These have no direct analogy in the compression process.

The other major application of expanding gases, refrigeration, includes:

1. Self-refrigeration processes, such as those involved in the production of dry ice, liquefaction of gases, or low temperature separation of gases.

2. Ordinary refrigeration processes, where the expanding fluid is a separate refrigerating medium such as ammonia or freon.

The cooling effect itself in a refrigeration process may come from the energy absorbed when the gas expands from a higher to a lower pressure, or when a liquid "expands" (evaporates) to a gas. The latter is not strictly an expansion process as we consider it here, and falls properly in the field of refrigeration rather than gas expansion.

Types of Expansion

There are several expansion processes. Some are directly analogous to compression processes. Some are not. Some have useful applications; others have not. As in compression, the processes of practical significance are the flow processes. We'll discuss most of the processes but the quantitative thermodynamic relationships will be shown only for those processes having practical commercial applications.

A gas may be expanded in various ways:

Non-flow reversible expansion against a piston—An illustration is a single stroke of a reciprocating expansion engine. This is exactly analogous to the non-flow compression stroke. In both cases the engine is assumed to be reversible. The expansion may be either adiabatic or isothermal. However, the non-flow expansion is significant only as a single stroke in the complete cyclic process.

Flow reversible expansion—This is directly related to the flow compression step. It can be considered as the summation of the intake, expansion, and exhaust strokes of a reciprocating machine, or as a complete cycle of a centrifugal turbine. The expansion could be either adiabatic or isothermal. Only the adiabatic case is industrially important and we'll discuss this in greater detail later. The reversible adiabatic flow expansion takes place in steam engines, steam turbines and expansion engines.

There are two major expansion processes which have no counterpart in compression. These are the "free" expansions. In these processes the gas expands through a restriction. There is no engine. No work is done. The process is completely irreversible. A "free" expansion may be either flow or non-flow, and either isothermal or adiabatic. Only the adiabatic flow free expansion has a large practical application, however.

Non-flow free expansion—This may be visualized as the release of pressure from a unit mass of gas. An example would be depressurizing a container. The gas within the container would be subject to a non-flow free expansion. If the process were done so slowly that heat is transferred, it would be an isothermal non-flow free expansion. In the usual case the process is rapid and the amount of heat transferred is negligible. This is a non-flow adiabatic free expansion.

Flow free expansion—This is the case where a gas flows continuously from a high pressure area through a restriction such as a valve, or a porous plug, into a low pressure area. This is a steady-state process wherein the high and low pressures remain constant. No work is done. The process is irreversible. If the flow is slow and heat is transferred rapidly, the process is isothermal. If the expansion is so rapid that heat transfer is negligible, the process is adiabatic. The adiabatic flow free expan-

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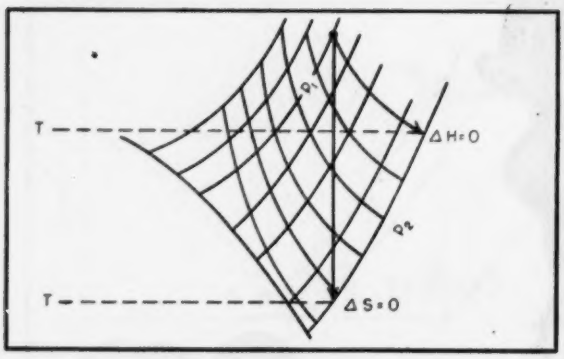
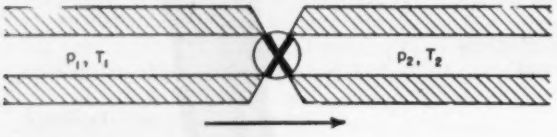


Fig. 4—Section of a temperature-entropy diagram.

sion is the one of the most industrial significance. It is known as the Joule-Thomson expansion and will be considered in greater detail.

Isentropic Flow Expansion

In the isentropic process, the gas is expanded in an expansion engine which does mechanical work on the surroundings. Since energy is extracted from the gas, it is cooled. As far as the thermodynamic treatment is concerned, the process is exactly the reverse of the isentropic compression. The same equations and methods of calculation apply for both ideal and non-ideal gases as for compression with the exception that now p_2 is less than p_1, T_2 is less than T_1, and work is done on the system. (See also *Chem. Eng.*, Dec. 1953, pp. 214-216)



Joule-Thomson Expansion

The Joule-Thomson process is also used for cooling gases (see above). Since the process is adiabatic $q_1 = q_2$. Applying Bernoulli's equation for a flow process,

$$U_1 + p_1V_1 + (u_1^2/2g) + Z_1 + q - w = U_2 + p_2V_2 + (u_2^2/2g) + Z_2$$

Neglecting the potential energy,

$$Z_1 = Z_2 = 0$$

Neglecting the kinetic energy,

$$u_1^2/2g = u_2^2/2g = 0$$

No work is done, $w = 0$. No heat is transferred, $q = 0$. Therefore,

$$U_1 + p_1V_1 = U_2 + p_2V_2, \text{ or}$$

$$H_1 = H_2, \text{ or}$$

$$\Delta H = 0$$

The free expansion is an isenthalpic process.

If a given gas at an initial pressure, p_1, were expanded to a lower pressure p_2, the process would be isentropic if an expansion engine were used, and isenthalpic if a throttling valve were used. These processes can be followed on a temperature-entropy diagram, Fig. 4. We can see from this figure that the use of an expansion engine will cause the gas to expand to a much lower temperature than the use of a throttling valve alone. In addition, the work done by the engine may be used in some other part of the process, or to generate electricity.

The Joule-Thomson Coefficient

The Joule-Thomson effect refers to the amount that the temperature of a substance can be lowered by reducing its pressure at constant enthalpy and may be expressed mathematically as $(\partial T/\partial p)_H$.

Let's use the thermodynamic transformations to see what the relationships between this coefficient and other properties of a gas are. Applying the techniques present in the thermodynamic transformations (*Chem. Eng.*, Oct. 1953, pp. 240-241), we shall evaluate the coefficient.

We know that enthalpy is a function of temperature and pressure, $H = \phi\,(T,p)$. Therefore:

$$dH = \left(\frac{\partial H}{\partial T}\right)_p dT + \left(\frac{\partial H}{\partial p}\right)_T dp \qquad (1)^*$$

We now want this in a form which contains $(\partial T/\partial p)_H$, and so we divide through by dp, and at the same time restrict to constant enthalpy,

$$0 = \left(\frac{\partial H}{\partial T}\right)_p \left(\frac{\partial T}{\partial p}\right)_H + \left(\frac{\partial H}{\partial p}\right)_T$$

or,

$$\frac{\partial T}{\partial p} = -\frac{(\partial H/\partial p)_T}{(\partial H/\partial T)_p}$$

The next thing is to evaluate the right hand term into something useful. From the definition of heat capacity,

$$C_p = \left(\frac{\partial H}{\partial T}\right)_p$$

$$\left(\frac{\partial T}{\partial p}\right)_H = -\frac{(\partial H/\partial p)_T}{C_p}$$

Now to get $(\partial H/\partial T)p$ in terms of p, V, and T, $dH = TdS + Vdp$ (*Chem. Eng.*, Oct. 1953, p. 239). Dividing by dp and holding T constant,

$$\left(\frac{\partial H}{\partial p}\right)_T = T\left(\frac{\partial S}{\partial p}\right)_T + V$$

We still have to get $(\partial S/\partial p)_T$ in terms of p, V, and T. This will be done by use of the exact differential equation, $dG = -SdT + Vdp$. Applying the law of exact differential equations,

$$(\partial S/\partial p)_T = -(\partial V/\partial T)_p$$

$$(\partial H/\partial p)_T = -T\,(\partial V/\partial T)_p + V$$

and,

$$\left(\frac{\partial T}{\partial p}\right)_H = -\frac{(\partial H/\partial p)_T}{C_p}$$

$$\left(\frac{\partial T}{\partial p}\right)_H = \frac{T\,(\partial V/\partial T)_p - V}{C_p} \qquad (2)$$

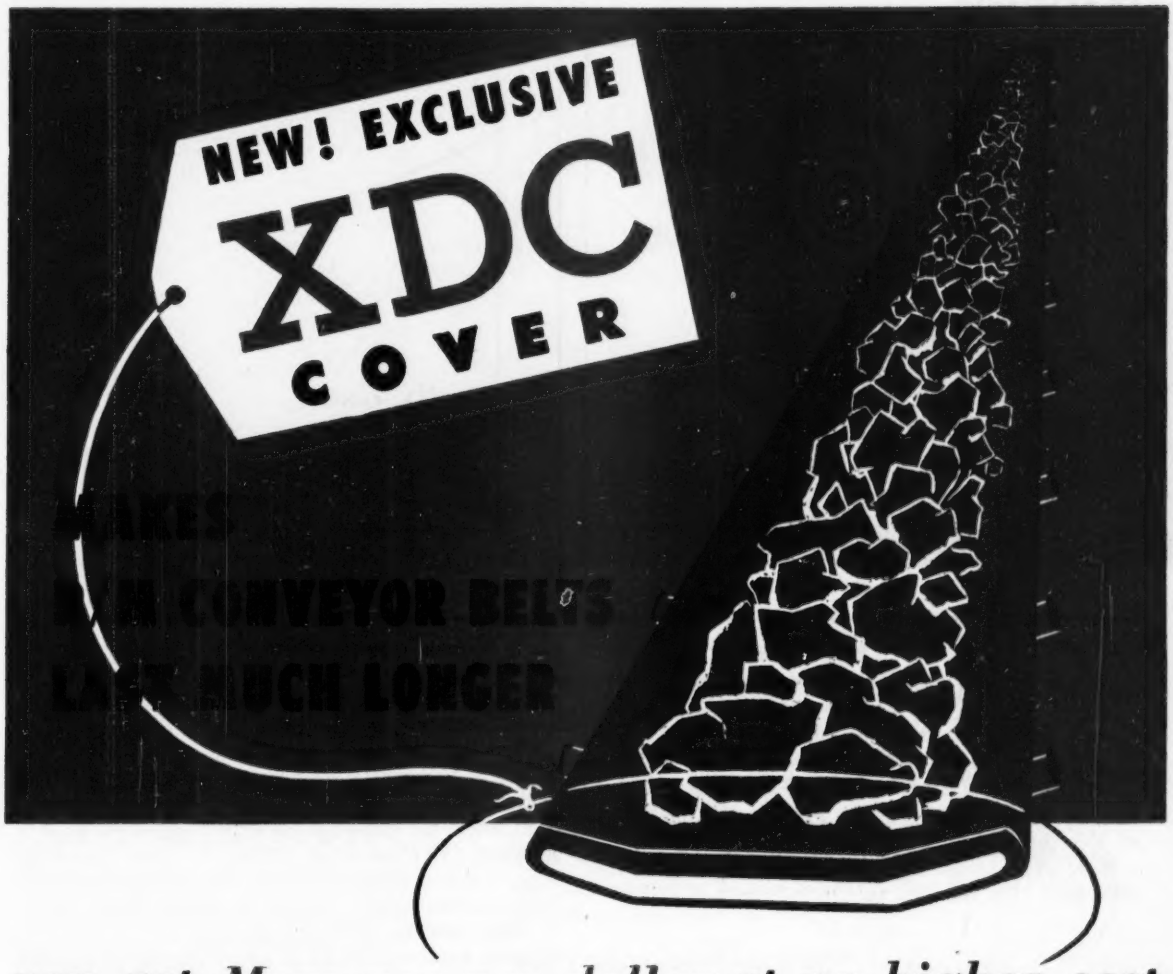
From this we see that if the term $T(\partial V/\partial T)_p$ is larger than V, the term $(\partial T/\partial p)_H$ is positive, and a decrease in pressure will also decrease the temperature. The gas will cool on expansion.

If $T(\partial V/\partial T)_p$ is equal to V, a free expansion will cause no temperature change. If $T(\partial V/\partial T)_p$ is less than V, the gas will heat up during a free expansion.

This may be shown in another way if the numerator and denominator of Eq. (2) are both divided by T. Then,

$$\left(\frac{\partial T}{\partial p}\right)_H = \frac{(\partial V/\partial T)_p - V/T}{C_p/T}$$

*This is similar to Eq. (14), *Chem. Eng.*, Oct. 1953, p. 241.



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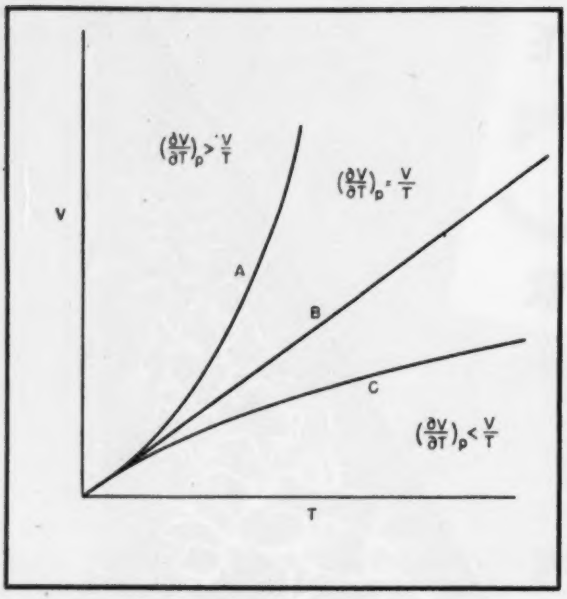

Fig. 5—Will a gas always cool on expanding? It depends.

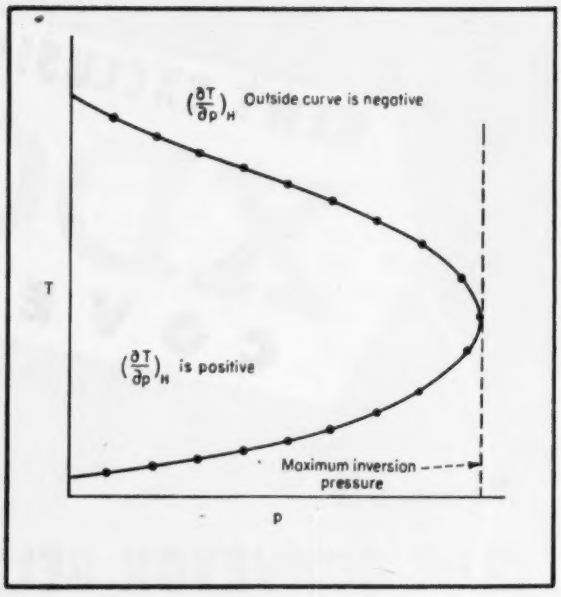

Fig. 6—Inversion temperatures vary with pressure.

Therefore, the three cases:

$$(\partial V/\partial T)_p > V/T$$
$$(\partial V/\partial T)_p = V/T$$
$$(\partial V/\partial T)_p < V/T$$

may be illustrated graphically. Fig. 5 represents a plot of V versus T with a constant pressure parameter.

Now let's consider how this applies to ideal and non-ideal gases. For the ideal gas,

$$pV = RT$$
$$V/T = R/p$$
$$V = TR/p$$
$$(\partial V/\partial T)_p = R/p$$
$$(\partial V/\partial T)_p - V/T = 0$$

Therefore the ideal gas is represented by line B in Fig. 5, where $(\partial V/\partial T)_p = V/T$, and thus the Joule-Thomson coefficient is zero. An ideal gas can not be cooled by free expansion.

Joule-Thomson Inversion Points

Will non-ideal gases always cool on expansion? Or are there some cases where the free expansion of a non-ideal gas will actually cause heating?

In curve A of Fig. 5, the instantaneous slope is greater than the average slope,

$$(\partial V/\partial T)_p > V/T$$

and therefore, $(\partial T/\partial P)_H$ is greater than zero. The gas will cool on expansion.

The plot of V versus T is constantly increasing in slope for gas A. Under what conditions would this be the case? Since for a non-ideal gas $pV = zRT$ and $V = (z)\ (R/p)\ (T)$, the compressibility factor z must increase with T at the constant pressure in question in order for the curve to have a continually increasing slope. Mathematically:

$$(\partial z/\partial T)_p > 0$$

Likewise, if $(\partial z/\partial T)_p$ is less than zero, the plot of V versus T at constant pressure will be similar to curve C, of Fig. 5 $(\partial T/\partial P)_H$ will be negative and the gas will actually heat up on expansion.

There are two other possibilities which may occur. A plot of V versus T may have an increasing slope initially, but may have an inflection and pass through a point where the instantaneous slope is equal to the average slope, (V/T), and then become less than the average slope. Or, it may start out with a decreasing slope which later increases until $(\partial V/\partial T)_p$ is greater than (V/T). In either case the point on the curve where $(\partial V/\partial T)_p$ becomes equal to (V/T) is called the inversion point. It is the point where the Joule-Thomson coefficient changes sign.

The inversion temperature for a gas is the temperature (at a given pressure) at which the Joule-Thomson coefficient changes sign. Fig. 6 is a plot of inversion temperatures versus pressure. For each pressure below the maximum there are two inversion temperatures. The area inside the curve is the region of positive coefficient, and outside the curve is of negative coefficient. This shape of curve is general for all actual gases.

However for hydrogen the upper limit is in the neighborhood of normal temperatures. Therefore, compressed hydrogen at room temperature will heat up on expanding. An interesting corollary of this is that if a high pressure reactor containing hydrogen should spring a pinhole leak, the escaping stream may become very hot.

REFERENCES

1. Dodge, B. F., "Chemical Engineering Thermodynamics," McGraw-Hill Book Co., Inc., New York (1944).
2. Edmister, W. C., Series of articles published in *Petroleum Refiner*, "Application of Thermodynamics to Hydrocarbon Processing," (1947-1949).
3. Hougen, O. A., and K. M. Watson, "Chemical Process Principles," John Wiley & Sons, Inc., New York (1947).
4. Smith, J. M., "Introduction to Chemical Engineering Thermodynamics," McGraw-Hill Book Co., Inc., New York (1949).

Next Month—Compression and Expansion-III will discuss centrifugal compression starting with thermodynamic relations, and then for non-ideal gases in polytropic processes and multistage compressions.

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THIS MONTH'S MOTOR TIPS

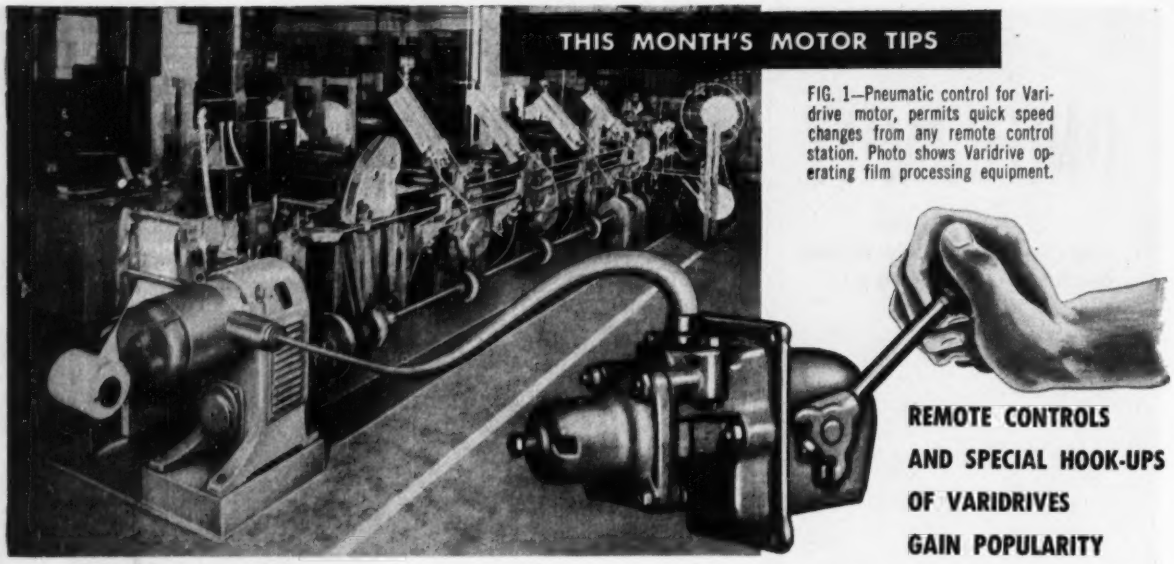


FIG. 1—Pneumatic control for Varidrive motor, permits quick speed changes from any remote control station. Photo shows Varidrive operating film processing equipment.

REMOTE CONTROLS AND SPECIAL HOOK-UPS OF VARIDRIVES GAIN POPULARITY

NEW DEVELOPMENTS in *VARIABLE SPEED* MOTOR DRIVES

RECENT innovations in variable speed drives include new and improved types of remote control equipment. Beyond the purely functional duty of a variable speed motor, such as a Varidrive, the latest methods of controlling it open up new adaptions to machines and equipment.

Motors cannot always be placed in a location convenient to the operator. In the case of fixed-speed motors this doesn't matter much because the operator has only to push a button to stop or start it, even if the motor is in the secluded center of a maze of machinery. But now, the manufacturers of the U. S. Varidrive motors have developed a complete line of remote controls to start, stop and regulate speeds sensitively set to a split rpm. Consequently a Varidrive motor can now be set in any location best positioned for the most compact and efficient hook-up and the operator can control it a mile away if necessary.

MECHANICAL AND ELECTRICAL

Remote controls of Varidrives may be basically divided into two classes, mechanical and electrical. The mechanical arrangements permit the use of extensions of the control dials straight out or universally positioned. For example, a Varidrive high up out of reach can be controlled from the floor by a simple extension supplied by the manufacturer. An excellent feature of the Varidrive control dial is that it is always located at the operator's station where he can dial from the slowest to the highest speed and read the calibrations of speed during dialing.

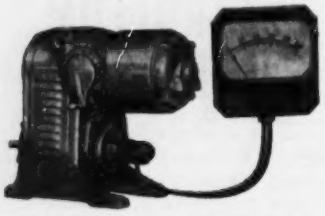


FIG. 3—Speed indicator tells Varidrive rpm at any distance. Can operate with push button if preferred.

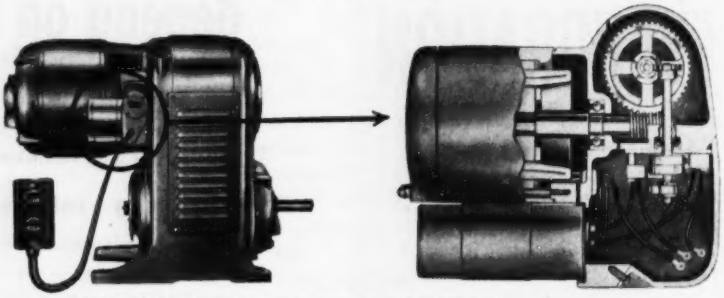


FIG. 2—ERC control motor changes speeds on Varidrive with push-button control.

For electrical controls, numerous arrangements have been perfected, of which one of the most popular is the Varidrive's Type ERC heavy-duty control motor. (Fig. 2.) Intead of the dial, this motor, which is 1/15 h.p., 1800 rpm, is attached to the control mechanism. It is a ruggedly designed auxiliary motor of the reversible capacitor type and has a low inertia rotor for quick stop, with push button control. Its rugged worm drive actuates the Varidrive's speed control and it has adjustable limit switches.

SPEED INDICATOR

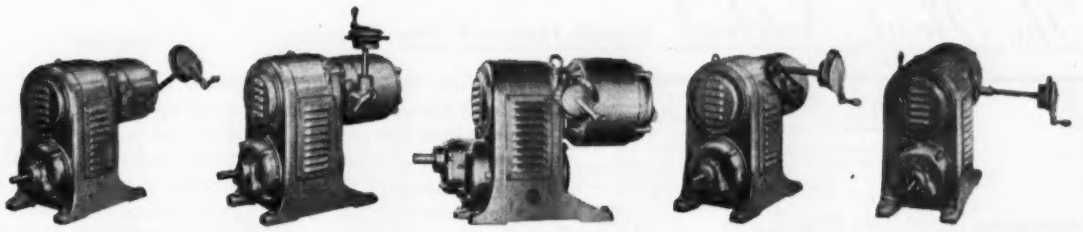
For electrically determining the speed of a U. S. Varidrive, a Type R1 speed indicator can be provided. (Fig. 3.) It consists of an enclosed tachometer with a generator mounted on and driven by the Varidrive. Speeds are indicated as per cent of maximum speed.

QUICK STOP CONTROLS

For machines requiring fast braking of Varidrive motors, the ICB brake is used. (Fig. 4.) It is mounted directly upon the Varidrive's take-off shaft, eliminating transmission of braking action through the belt. Such a device is ideal for "inching" or jogging. Its functional force is controlled by magnetic action.

The Warner automatic clutch is also used on many Varidrives, particularly on heavy presses for gradual pick-up to overcome heavy inertia. To properly adopt this improvement, the manufacturers of Varidrives provide special engineering service.

TYPES OF MANUAL REMOTE AND ON-MOTOR CONTROLS FOR VARIDRIVES



UNIVERSAL COUPLING
FIG. 6—For operating Varidrive at any angle to 30°. Rod any length.

RIGHT ANGLE DRIVE
FIG. 7—Control dial set at any of four 90° positions at right angle to standard setting.

ON-MOTOR CONTROL
FIG. 8—Not remote control, but showing location of control dial on motor.

CHAIN & SPROCKET
FIG. 9—Sprocket connected to rod by chain drive with two bearing supports.

DIRECT EXTENSION
FIG. 10—Rod connects Varidrive through sleeve coupling to project any length.

PNEUMATIC CONTROLS

When frequent motor speed changes are necessary, a pneumatic control is preferable. (Fig. 1.) Such a control as used in Varidrives includes a positioning unit embodying an air-operated plunger attached to the motor's speed changing device and a pressure regulator. Many methods may be used to operate the regulator such as pedal, lever, cam or wheel. By use of check valves and control station selectors, speed of the Varidrive can be changed from any number of control stations, or several Varidrives can be operated from one control. This device will operate on the customer's air supply of 60 or 100 psi or more.

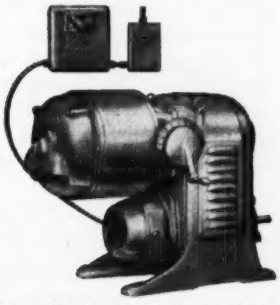


FIG. 4—Brake control instantly stops Varidrive. Excellent for "inching" motor.

AUTOMATIC SPEED REGULATION

In case a motor user operates such mechanisms as follower rolls and air cylinders which permit movement proportional to the desired speed range and can be mechanically linked, a compact lever actuator can be attached to a Varidrive motor. (Fig. 5.) Maximum/minimum speeds may be pre-set by means of adjustable speed stops located on the exterior.

DIRECTIONAL MANUAL CONTROLS

In what position a Varidrive is set in relation to the driven machine and operator's position of accessibility depends the location of the manual control dial. The case of the Varidrive is so designed that the control dial can be placed on the front side, back or top, and the take-off shaft positioned to right or left, high or low. This feature is of special interest to the design engineer who wants the most compact setting with greatest convenience to the operator.

OTHER VARIDRIVE INNOVATIONS

A notable improvement in Varidrives is the use of a double-ribbed varibelt which not only allows maximum flexing but permits use of smaller disc diameters. Greater horsepower can be developed within a smaller space. This newest of belt features reduces internal friction and provides greatest flexibility without sacrifice of strength. Dual varibelts, double-ribbed, are also available for high horsepower. For extra heavy duty, dual varibelts are provided for 25, 30, 40 and 50 horsepower.

FIG. 5—Automatic speed regulation to pre-set limits on Varidrive by lever control.

Of interest to those seeking a variable speed motor in fractional horsepower is the new VA Varidrive. It is an all-in-one power package in ¼, ⅓, ½ and ¾ horsepower ratings in one or 3-phase.

Those who have used Varidrive motors quickly recognize the improved output that can be obtained in almost any machine. Variable speed has become such an important factor in the mind of the aggressive design engineer that he has found it feasible to redesign equipment to take full advantage of variable speed potentials. With the availability of any desired Varidrive control system he finds new fields of application not heretofore possible.

A number of interesting engineering booklets have been written and profusely illustrated by the makers of U. S. Varidrive motors dealing with remote controls and variable speed applications. Copies may be obtained from U. S. Electrical Motors Inc., Box 2058, Los Angeles 54, California, or Milford, Connecticut.

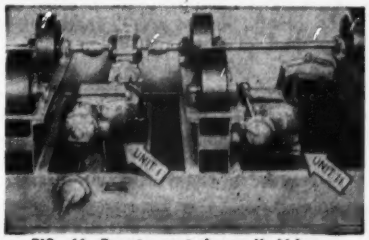


FIG. 11—Remote controls on Varidrives operating automatic welding machine.

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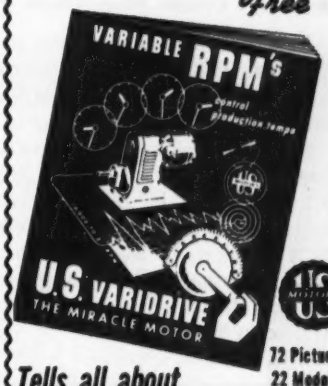

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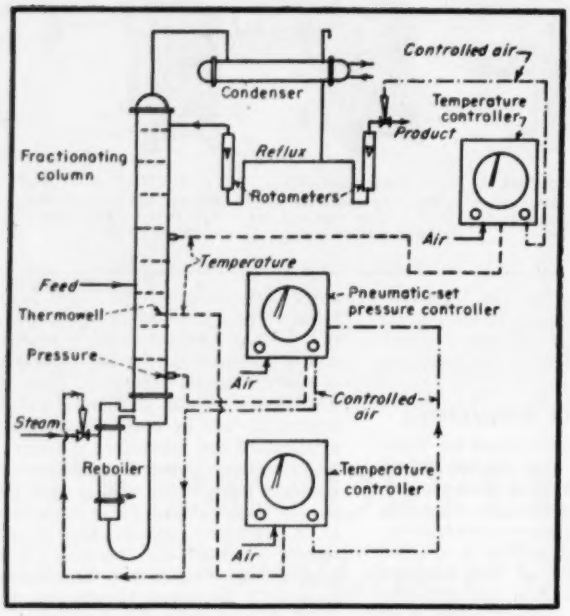

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Many different variables and combinations of variables have been used to control fractionating columns, including feed rate and temperature, heat input to the reboiler and extraction in the condenser, and reflux ratio or rate.

Feed rate is often set by a flow controller and the steam flow valve is adjusted by the differential pressure across the column, or by the temperature at a level in the column at which a gradient of several degrees exists from plate to plate. In such a system reflux ratio or rate can be held constant with a flow splitter or flow control valve, or else automatically adjusted with a controller actuating a valve in the product line by variations in temperature in the enriching section.

When the pressure differential controls boil-up rate, steam flow is automatically set to operate at an entrainment level consistent with avoidance of loading the column and with attainment of desired product composition. Maintenance of the selected pressure drop will assure that the column works at the proper entrainment level and as a fractionating device. Pressure control of steam flow is thus used to run the column at maximum boil-up capacity. When pressure drop approaches the loading value, steam flow will be reduced and, as the pressure drop decreases below the control point, steam flow will be increased. However, the disadvantage of pressure control of steam flow is that the controller cannot detect loss of overhead components to the bottoms caused by changes in feed composition. Hence, it cannot compensate for such a trend.

Temperature at some level below the feed plate is also used to control steam flow. This method operates with minimum steam consumption for a given feed and reflux rate, but the temperature controller cannot detect how near to loading the tower may be, and one must sacrifice capacity to be certain of operating in an hydraulically stable range.

The diagram presented here shows one way to combine the desirable elements of pressure and temperature control of the steam flow, while allowing tower operation near the loading point, yet preventing overhead product components from flowing to the bottoms if feed composition should change. As shown, feed rate is held constant by a flow controller. Reflux ratio is automatically varied by a temperature controller which operates a valve on the product outlet line.

HOW THE SYSTEM WORKS

Column differential pressure is controlled by the set point of the pneumatic-set controller. Temperature below the feed plate is controlled at the selected value by the set point of the temperature controller.

When temperature level at the thermowell in the stripping section is at the set point of the temperature controller, steam flow will be controlled by the pneumatic-set controller output alone, at a value to maintain operation near, but below the loading point. When the temperature deviates from the set point of the temperature

---

★ November Contest Prize Winner

"How to Sample Liquid Flows Without Danger of Plugging by Solids."

A prize of $50 in cash will be awarded to G. E. Schumann, chemical engineer, Process Department, Westvaco Chemical Div., Food Machinery & Chemical Corp., Carteret, N. J. The article will appear in February.

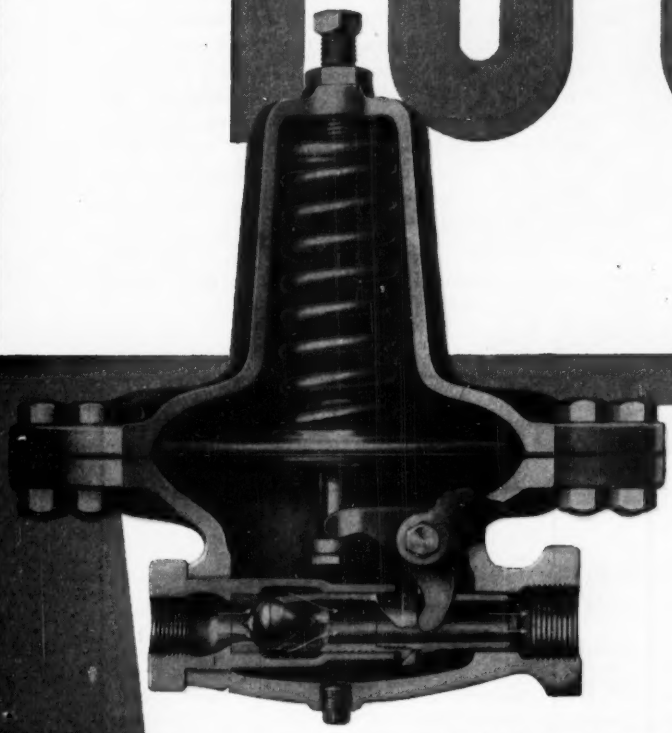
$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering* will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook. Each month's winner will be announced the second following month and published the third following month.

$100 ANNUAL PRIZE—At the end of each year the monthly winners will be rejudged to determine the year's best Plant Notebook article, which will then be awarded an additional $100 prize.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 500 words, but illustrated if possible. Articles which are acceptable but are not winners will be published at regular space rates ($10 minimum).

Articles may deal with plant or production "kinks," or novel means of presenting useful data, which will interest chemical engineers. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 36, N. Y.

TYPE 1000 VALVE



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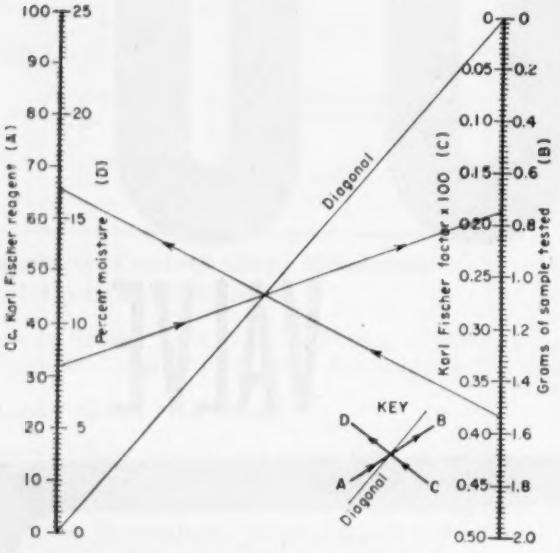
controller, that instrument will send an air signal to the pneumatic-set controller which then will change the steam flow to maintain the correct temperature.

The pneumatic-set controller has a reset bellows and linkage that automatically adjusts the output air to the steam valve in accordance with variations in input air pressure coming from the temperature controller. A set pointer travel limit on the pneumatic-set controller prevents column loading level from being reached by output from the temperature controller. When the temperature returns to the set point of the temperature controller, the pneumatic-set pointer control index and output air will return to the original values.

Thus, this system has an inherent flexibility in controlling boil-up rate in fractionating columns that cannot be obtained by pressure or temperature control alone.



Nomograph Speeds Calculation of Moisture Content of Samples

MICHAEL AURO, *Polytechnic Institute of Brooklyn, Brooklyn, N. Y.*

The Karl Fischer reagent is widely used in industry as a tool with which to determine the amount of water present in many liquid and solid samples.

The reagent consists of iodine, pyridine, sulfur dioxide, and methyl alcohol, and is usually standardized with a solution containing a known amount of water, with pure water, or with an inorganic salt containing a known amount of water of hydration. The factor obtained is expressed as grams of water per cc. of reagent.

When a sample of known weight is titrated with this reagent, a specific quantity of reagent is required to obtain an "end point." This volume of reagent, when multiplied by the K. F. factor, quantitatively represents the weight of water which was present in the sample tested. Therefore, knowing this quantity and the weight of sample used, the percent moisture is obtained by a simple division of the two quantities.

The calculation is expressed as: Percent moisture = (K. F. factor) (cc. reagent used) (100)/wt. of test sample, in grams.

Example—0.750 grams of sample required 32.0 cc. of Karl Fischer reagent to obtain an end point. If the Karl Fischer factor was 0.00385 grams of water per cc. K. F. reagent, what was the percent moisture of the sample?

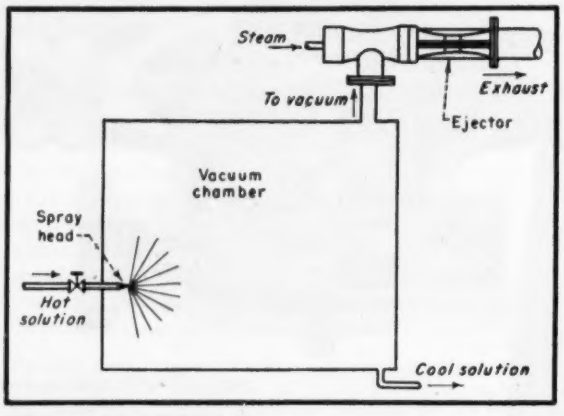
Solution 1—Using the above equation: Percent moisture = (0.00385) (32) (100)/(0.750) = 16.43 percent.

Solution 2—Using the nomograph: (1) Set cc. of reagent (32) on the *A* scale; (2) set grams of sample tested (0.750) on the *B* scale; (3) connect these two points with a straightedge and note where it intersects the diagonal; (4) set the Karl Fischer factor × 100 (0.385) on the *C* scale; (5) connect this point with the intersection point on the diagonal reference line obtained in (3) and extend to intersects the *D* scale; (6) read percent moisture on *D* scale. In this case it is 16.40 percent.

Correction

Several errors unfortunately crept into the article, Use a Mail Scale to Find Blower Capacity, by Thomas N. Dalton, which appeared on p. 211 of the October 1953 issue. With the exception of a minor printer's error, these errors were the editor's own, probably coming from use of the wrong kind of midnight oil in simplifying the mathematics accompanying Mr. Dalton's interesting idea.

In the last paragraph the expression for F should have been $F = wV/g$. The coefficients were dropped from the two working equations which should have been $v = 3{,}710\sqrt{f/a}$ and $q = 25.7\sqrt{fa}$. Finally, in the nomenclature the dimensions of w, the weight rate of air flow, unaccountably became lb./cu. ft., whereas they should have been lb./sec.—EDITOR.

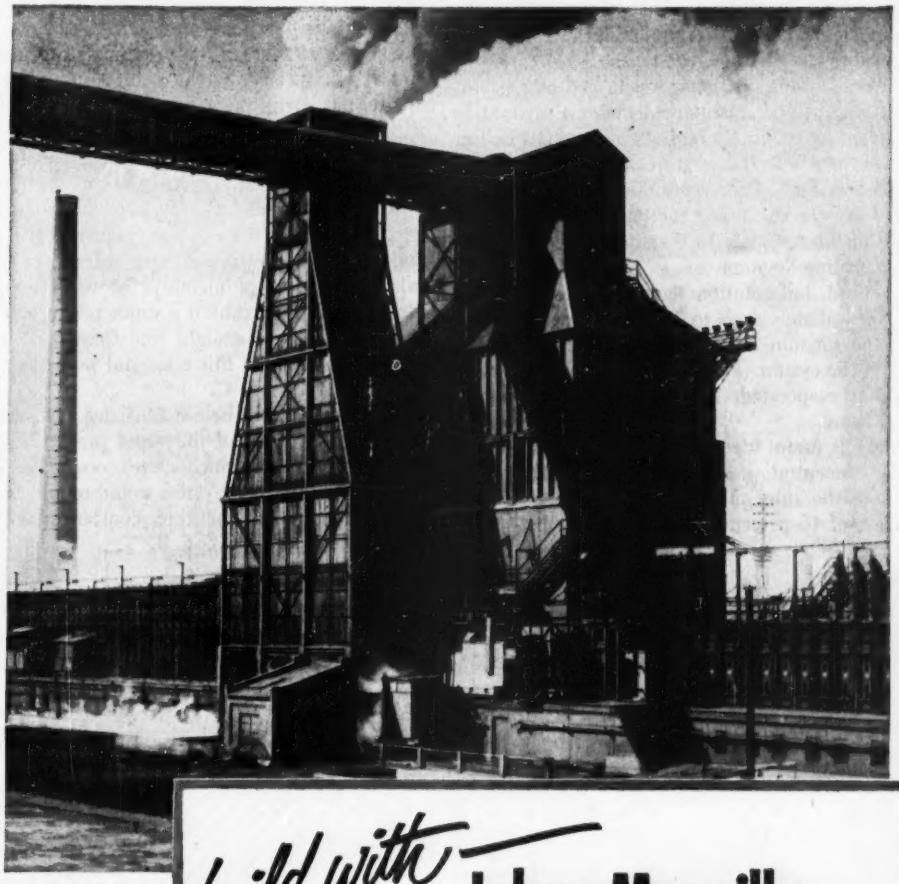


Flash Cooling Is Handy for Quick Cooling of Solutions

ANTHONY P. MASSA, *Research Fellow, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.*

In some chemical plant operations, where a concentrated solution is diluted, or where a dilute solution comes from a reaction run at a high temperature, rapid and efficient cooling of the solution may be necessary if the material is to be used in a subsequent reaction where a lower

No costly maintenance problem here



So severe are the steam and fume conditions in this coke quencher station, that the heavy structural steel framing is on the *outside*, protected by J-M Corrugated Transite

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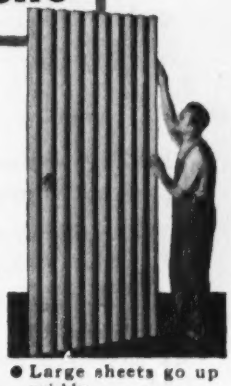

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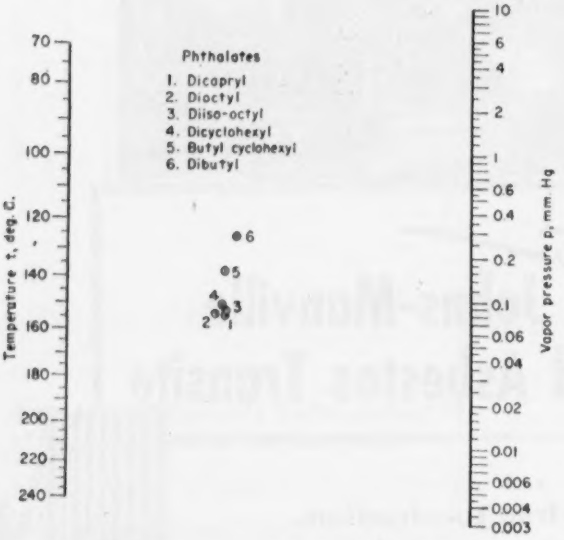
temperature is required. Where dilution of a solution also liberates heat (as in the case of strong alkali solutions), cooling also would be required if the solution is to be used in low temperature reactions.

In either case, cooling can be accomplished by spraying the liquid into a chamber maintained under a vacuum by means of a steam jet ejector. A high vacuum causes boiling of the solution at a low temperature and produces rapid evaporation of water. The vaporization of the water absorbs heat from the remaining solution, causing its temperature to drop immediately to that of the boiling point under the prevailing vacuum.

By this method, hot solution temperatures of close to 200 deg. F. immediately drop to 70 deg. F., or lower, depending on the vacuum maintained in the chamber and the capacity of the ejector. For rough estimation, for every pound of water evaporated, 10 lb. of solution is cooled 100 deg., or more.

This method is useful where cooling water is scarce, or where a prior concentration of the hot dilute solution will be beneficial in the subsequent reaction, since a concentration increase of 10 percent or more may occur.



Vapor Pressures of Phthalate Esters Given by Nomograph

D. S. Davis, *Professor of Chemical Engineering, Virginia Polytechnic Institute, Blacksburg, Va.*

In view of the industrial importance of phthalate esters as plasticizers, their vapor pressures are of interest since this property is closely related to loss by evaporation. Employing a modified dewpoint method at low temperatures and a simple tensimeter still at higher temperatures, Werner (*Ind. Eng. Chem.*, **44**, 2736, 1952) determined the vapor pressures of six specially purified phthalate esters and presented the data in a series of graphs and equations.

The accompanying line coordinate chart consolidates, in effect, Werner's six plots and extends the utility and convenience of the original data by providing more closely graduated scales. For dicapryl, diiso-octyl, dicyclohexyl, and butyl cyclohexyl phthalates, the gage points on the chart are based on Werner's values of A and B in the equation $\log p = -A/(t + 273) + B$, where p = pressure, mm. of mercury, t = temperature, deg. C., and A and B are specific to the compounds. For dibutyl and dioctyl phthalates the gage points are essentially consistent with the plots for these esters.

The use of the line coordinate chart is illustrated as follows: What is the vapor pressure of butyl cyclohexyl phthalate at 150 deg. C.? By means of a straightedge, connect 150 on the t-scale with gage point 5 for this ester and note the intersection with the p-scale at the desired value, 0.35 mm. of mercury. At what temperature does dicapryl phthalate exhibit a vapor pressure of 0.20 mm. of mercury? Draw a straight line from 0.20 on the p-scale to gage point 1 for this ester and note that it crosses the t-scale at 170 deg. C.

At temperatures below 100 deg. C. the chart gives slightly high values of the vapor pressures of dibutyl and dioctyl phthalates, since close correlation of the vapor pressure data for these esters would require, over the entire temperature range, the three-constant Antoine equation, $\log p = -A/(t + C) + B$.

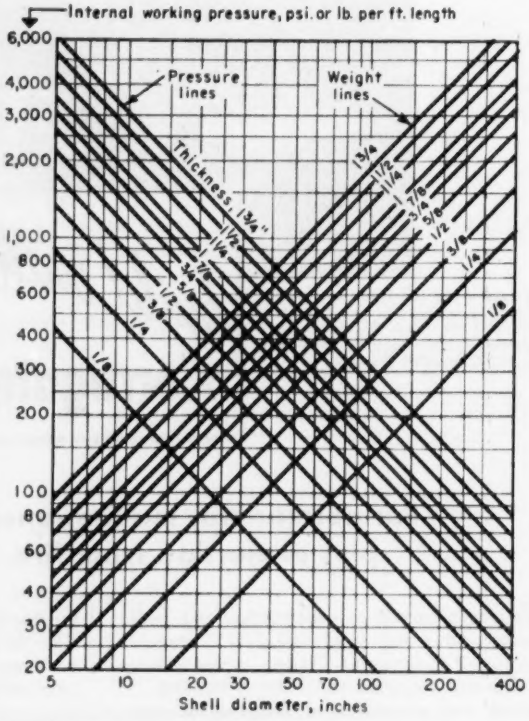


Chart Gives Vessel Wall and Weight for Estimating

Robert B. Reed, *Engineering Dept., Air Products Inc., Allentown, Pa.*

The chart above is convenient for preliminary estimation of the cost of low-pressure vessels of hot-rolled carbon steel, stainless steel, Everdur 1010 and copper. Many engineering concerns price pressure vessels on a cost-per-lb. basis. With the chart it is possible to find (1) the thick-

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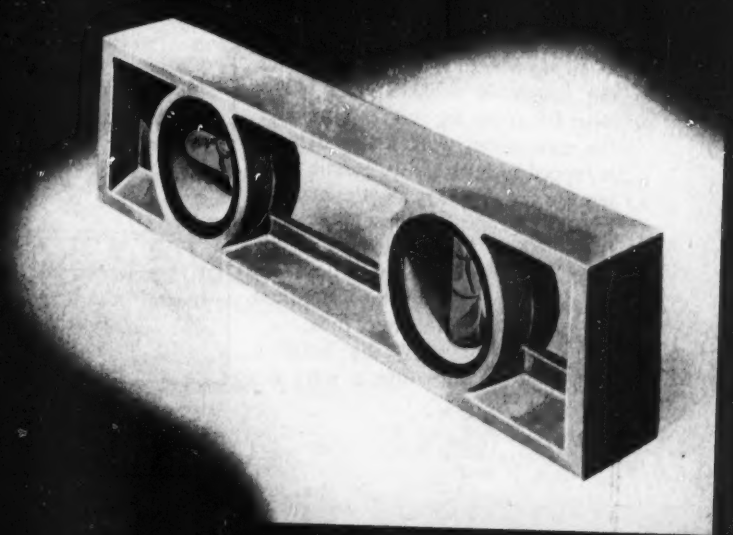


ness of material needed theoretically (without corrosion allowance) for any vessel diameter and working pressure; and (2) the weight per foot of vessel length.

The pressure lines on the chart are obtained as follows: For approximate calculations, shell thickness is $t = Pd/2SE$, where t is the thickness, inches; d is diameter, inches; P is the working pressure, psi.; S is the allowable stress, psi. (11,000 for carbon steel and Everdur 1010, 15,000 for stainless steel); and E is the joint efficiency = 0.8. Rearranging this equation, $P = 2SE(t/d)$. For steel $P = 17{,}600\ (t/d)$. Since this equation plots as a straight line on log paper, two points suffice for each plate thickness. From the equation the pressure lines are plotted, as internal pressure vs. vessel diameter, with a line for each plate thickness from $\frac{1}{4}$ to $1\frac{1}{4}$ in.

The weight lines for 1 ft. of vessel length are obtained by means of the equation $W = \pi Dw$, where W is the weight in lb. per foot of vessel length; D is the vessel diameter in feet; and w is the weight of the shell material in lb. per sq. ft. For steel $W = 128(tD)$. Again, two plotting points will serve for each plate thickness. From the equation the weight lines are plotted as weight per foot vs. diameter for each plate thickness from $\frac{1}{4}$ to $1\frac{1}{4}$ in.

The chart can be used for other materials than carbon steel by correcting either for the allowable working stress, or for the weight of shell material per sq. ft., or both. For example, for stainless steel, multiply the allowable working pressure by 15,000/11,000 = 1.365. For Everdur 1010, the allowable stress is very nearly the same as for hot-rolled steel, so the pressure-thickness relation will be the same, but the weight ratio is 0.323/0.283, so that for Everdur 1010 the weight obtained from the chart should be multiplied by 1.14. For copper the working pressure should be multiplied by 0.57, and the weight by 1.14.

WINNER OF $100 ANNUAL PLANT NOTEBOOK AWARD

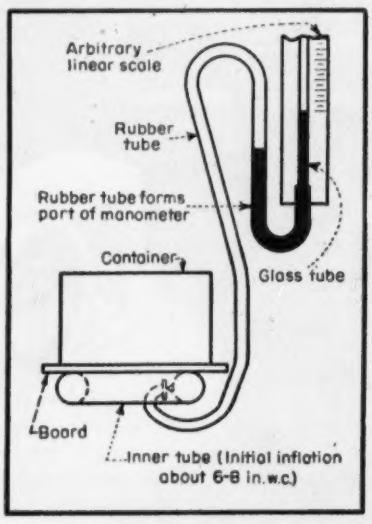
How an Inner Tube Can Serve as a Scale for Weighing in Field*

DAVID H. GIESKIENG, *Denver District Office, Allis-Chalmers Mfg. Co., Denver, Colo.*

Here is a simple little trick that can be used for making continuous weight measurements in the field. It is also useful for experimental weighings where a scale of suitable size isn't available. Although not recommended for permanent use it can substitute with surprising accuracy for regular scale equipment in emergencies when no scale is to be had.

All it requires is an automobile inner tube—a 6.00-16 tube will be fine—together with a board, a piece of rubber tubing and a short length of glass tubing for an open type manometer. These items are assembled when needed as shown in the sketch, with the inner tube initially inflated to about 8 in. water-column pressure. It is connected without the stem valve to an open manometer by means of the length of rubber tubing. The latter forms one leg and the bottom of the manometer, while the glass tube is slipped into its end to permit viewing the liquid which fills the manometer. This can be water containing a little ink. Of course, the top of the U-bend in the rubber tube must be high enough to prevent the water from flowing back into the inner tube.

To use this scale, the board is placed on the inner tube to serve as a platform. If the load to be weighed is a solid it can be put directly on to the board. If it is a liquid, it can be run into a container supported on the board. The number of ways in which this simple rig can be used is almost limitless. In any event, it will have to be calibrated, but this can be done simply with a couple of known weights, since the calibration is linear. Note that at the "zero" of the scale the manometer levels will be unequal, because of the initial sealing air pressure needed to support the inner tube itself, the platform and the container for the load.

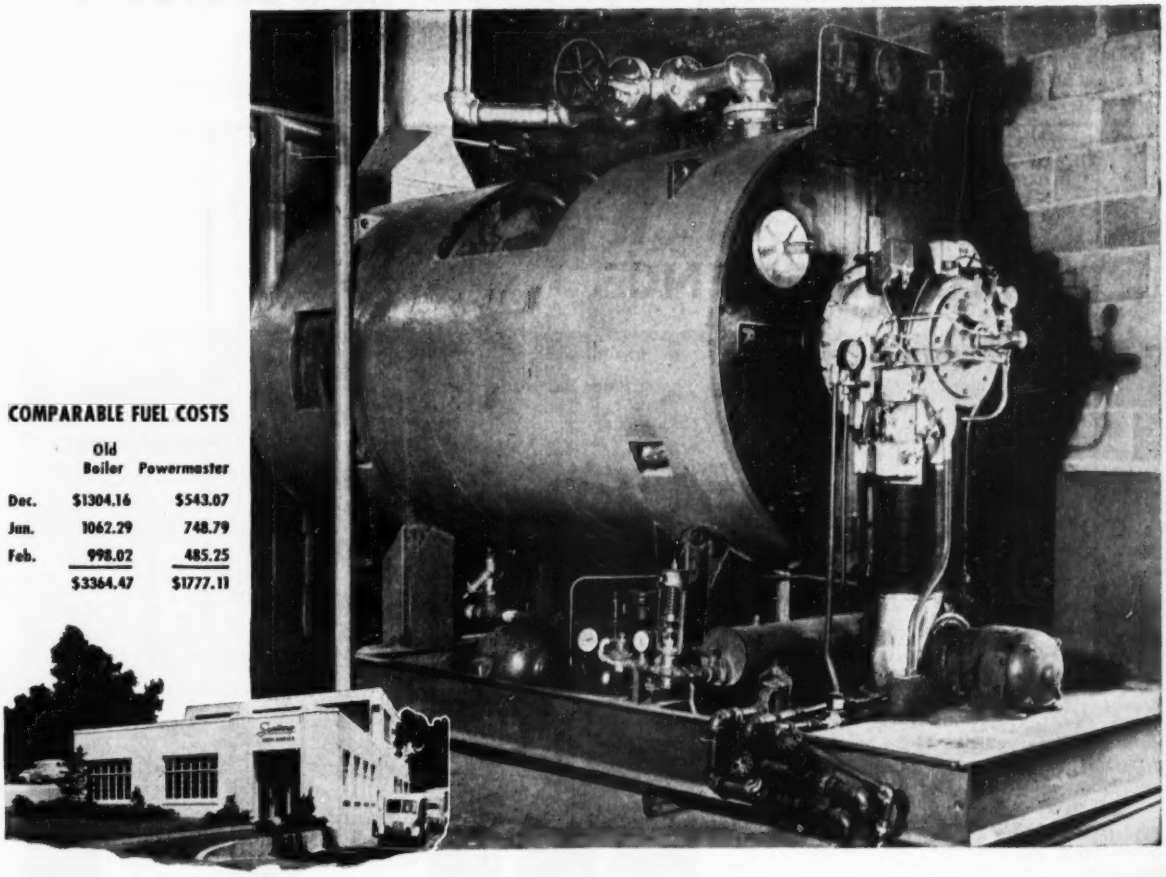


Whenever a test sample is received in the container, this will immediately be reflected in an increase in inner-tube pressure, which is continuously indicated by the manometer. If for any reason a weight-against-time record is needed, this can be obtained by recording the manometer readings visually against time; by setting up a clock along side of the manometer and photographing both with a movie camera; by making multiple exposures with a still camera; or by substituting a recording pressure gage for the manometer. Continuous weight-time records are often valuable in determining both the continuity and rate of liquid or small-solids flow.

The components needed for this scale can usually be found about the job. Thus, when elaborate equipment is not at hand, the problem of making continuous weight readings under field conditions need not be a serious one at all.

*Here, reprinted from the November issue, is the article chosen as the best monthly Plant Notebook winner of 1953. In addition to the $50 monthly prize which he has already received, the author will receive an added $100 prize.

in FOOD PROCESSING PLANTS



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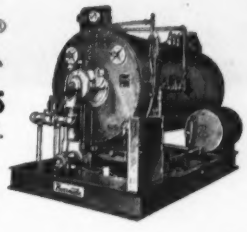

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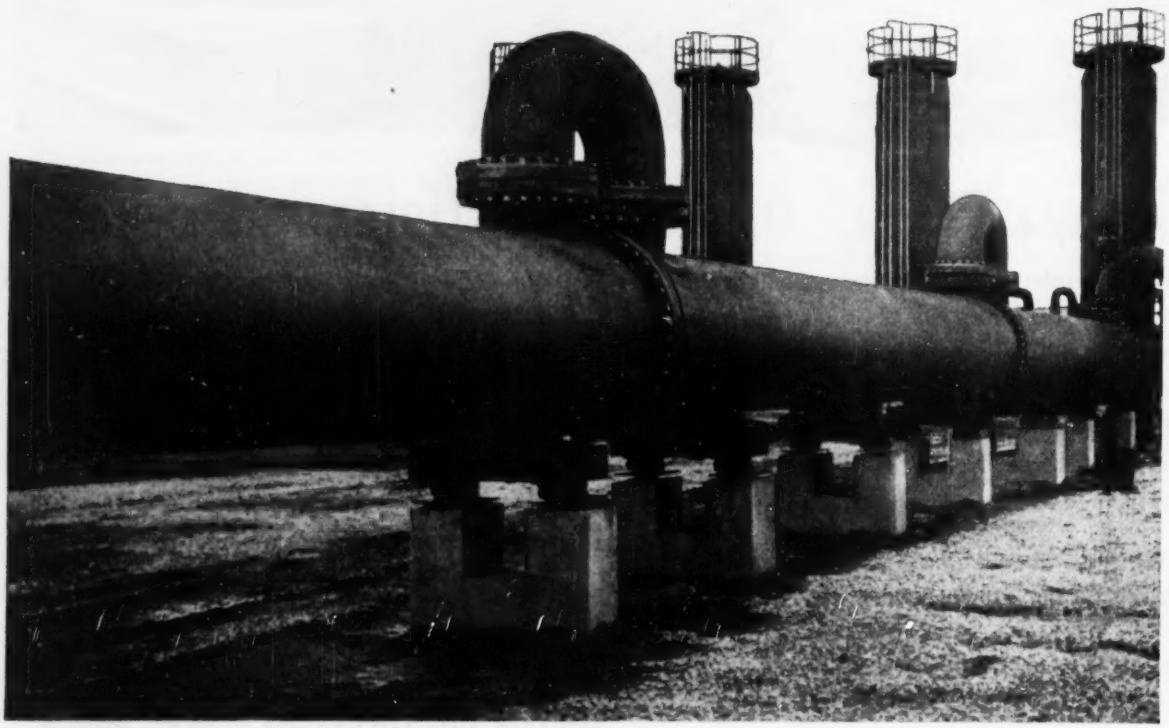
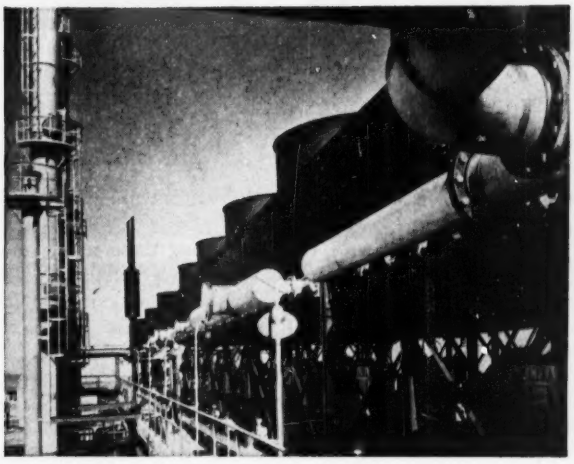


150 FT "TRAIN" HEAT EXCHANGERS, designed and built by Alco with special flange-to-flange construction, step up efficiency at Tennessee Gas Transmission Company's huge gas processing plant at Gabe, Kentucky. Other Alco units at Gabe include ethylene flash drum, demethanizer tower, primary feed cooler.

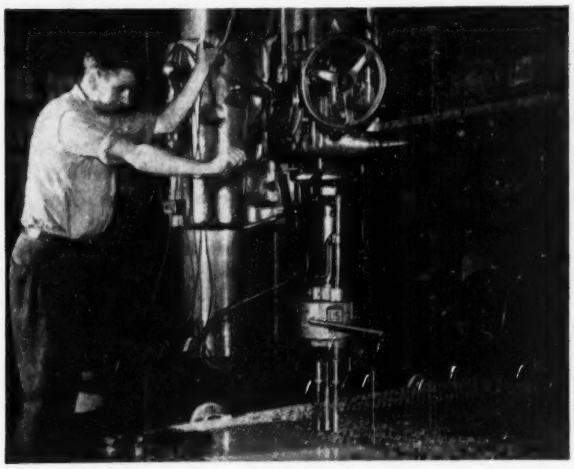
PROCESSING problems

...examples of the wide variety of heavy-metal equipment designed and built by Alco to meet today's demands in petroleum and petrochemical processing.



SPECIAL ALCO AIRCOOLERS, with many components of aluminum and stainless steel, handle 80 percent of cooling load at Celanese Corporation's new 630-acre petrochemical plant at Pampa, Texas. Units have removable headers and slide-out tube bundles, operate in constant presence of highly corrosive acids, chemicals and gases.

PRIMARY AND ATMOSPHERIC TOWER CONDENSERS, plus stabilizer condenser, naphtha cooler, kerosene and diesel oil exchangers, are among the many Alco units at Canadian Oil Refineries' new $23,000,000 plant at Sarnia, Ontario. This plant produces more than 115,000,000 gal. of gasoline annually, claims first catalytic reformer in Canada.



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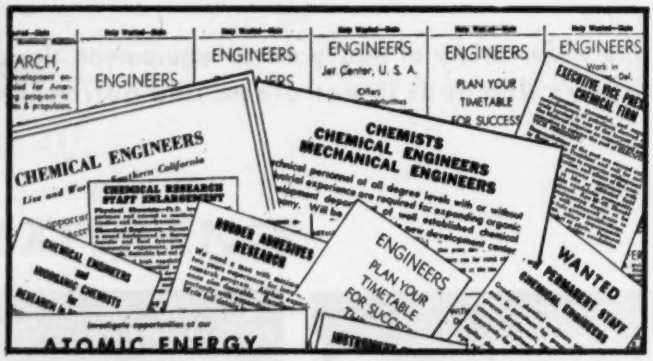

In the plant

How to Attract and Hold Engineering Talent

Here are the results of an outstanding survey which tells why good men quit and what can be done to keep them. It also sets down the techniques found most successful for recruiting graduates.

The lid is off one of the hottest—and best—personnel studies in recent years.

It tells your company how to keep good men—and get a fair share of the new graduates.

On one side of the fence some 1,400 engineers in industry have squared off to tell management in frank and eye-opening terms what they like—and don't like—about their jobs.

Forty-five percent of these men, for instance, don't like their pay. Others are dissatisfied with prospects for advancement, nature of work, company location and other things.

On the other side of the fence, executives from some 200 companies tell a different tale of woe.

Their thesis, in part, is that many engineers are overpaid for what they turn out simply because there is a shortage and because government money is easy to get.

They go on to say that the young engineer's attitudes are "unprofessional," that his "research approach" and his lack of knowledge of practical economics as applied to business and industry in general, are definite drawbacks to his progress.

"Many engineers," they seem to be saying, "are merely tongue-tied technologists with extremely one-sided educations."

They also indicate that a good many engineers lack imagination and adventurousness, and that they are unwilling to bet on anything but a sure thing.

Are they right?

If you're a rugged individualist, you may be more than a little disturbed by one surprising fact the survey turned up.

Among 1,300 engineers who answered the question, 42 percent said they would not accept a higher paying job with more responsibility if they were not assured of the same level of security of employment as existed in their present jobs.

You'll be seeing these results soon in "Executive Survey Number 3: How to Attract and Hold Engineering Talent." This survey, like its predecessors,* has been made by the Professional Engineers Conference Board for Industry and the National Society of Professional Engineers. It covered 200 companies and 1,400 individual engineers by mail questionnaire and field survey. Here are some of the other highlights quoted from the Conference Board's survey:

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* Executive research surveys 1 & 2: How to Improve Engineering-Management Communications; How to Improve the Utilization of Engineering Manpower (available from the National Society of Professional Engineers, 1121 Fifteenth St., N. W., Wash. 5, D. C.).

What Does the Young Engineer Want?

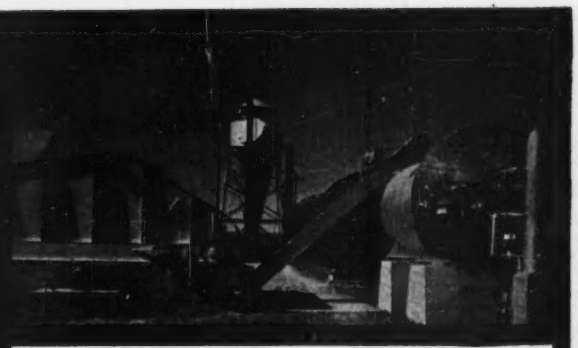
- **Security comes first for many—then opportunity**
- **He also wants satisfaction, a sense of achievement**

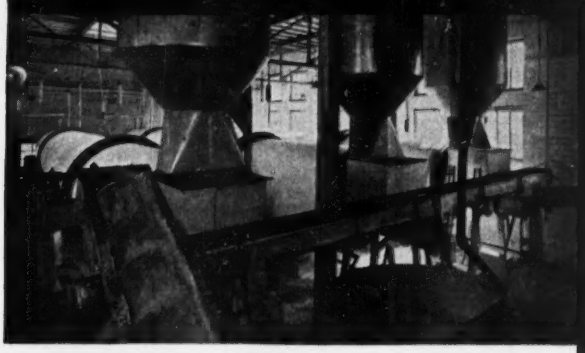
"Adventurous engineers still are building radio stations high in the Andes, air fields in Africa, chemical plants in the jungles and deserts of the world. There are still modern counterparts of Goethals and Steinmetz and Hoover and Lewis.

But the average young engineer of 1954 is not looking for glamour in far places, but for security, both immediate and for the years to come. Although he was still a small boy when the great Depression of the thirties ended, the young graduate of today still remembers its dislocations and its effects, perhaps on his own family, and he wants a safe berth for himself in industry. This is proved by the answers previously quoted.

It also seems that while many young engineers are willing to put themselves at the mercy of their employer, they are not entirely happy with their lot. In addition to the 45 percent of the engineers not happy with their salary, thirty-four percent were dissatisfied with their prospects with their company; 17 percent

more than 50 years of experience in designing and building dryers for industry...





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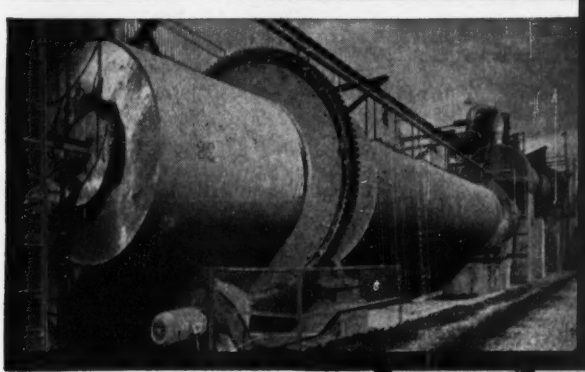

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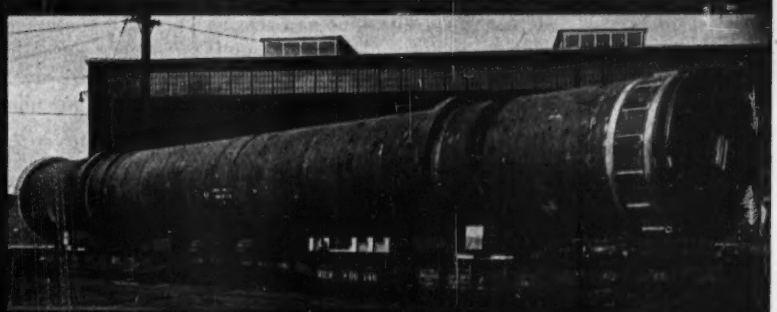

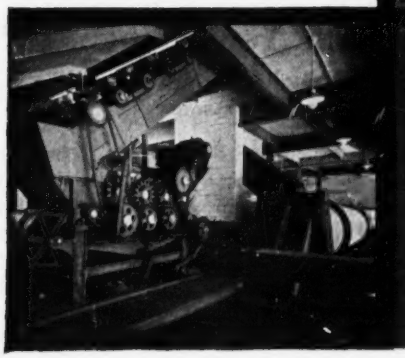

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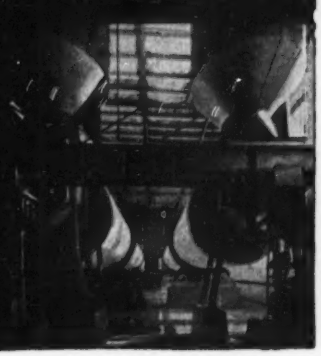

thought working conditions were poor; 16 percent didn't like the nature of their work; and location was vetoed by 13 percent.

WHAT EMPLOYER WANTS

Employers took the opposite view of the salary attitude, though.

"Young engineers must be made to realize that their engineering understanding must be converted to productive output," said one superintendent of engineering personnel. "Too many of them feel that they can understand a bigger job, but overlook the fact that their output in their present job is far from satisfactory."

Said another:

"The free flow of Government money has completely upset the engineering profession from the standpoint of the engineers being able to get high pay for little effort."

The survey went on to ask whether engineers were kept currently informed of their personal progress within the company.

Eighty-five percent of the executives said "yes"—but 50 percent of the engineers said "no."

It is possible that both were right since many times more engineers than executives were surveyed, and the latter were hand-picked from among companies known to have progressive and successful personnel policies, while the large sampling of engineers reflected a fair cross-section of American engineering activity—good and bad.

It is plain, though, that more than half of that large group of engineers don't know whether their employers are satisfied with their work or not. And they would like to know.

HALF USE MERIT RATINGS

The NSPE report finds that only about half of the companies surveyed —and these are "progressive" companies—make use of a merit rating system. Seventy-eight percent of the engineers—including a large proportion of the discontented group and the group which feels that industry is not making effective use of their training and talents—said they would like to have their work evaluated by a merit rating system.

The mandate is clear.

The survey finds that one of the best devices not only for recruiting new engineers but also for retaining their services is the maintenance of an adequate training program, coupled with a policy of upgrading professional personnel from within.

The Survey

- **More than 200 companies employing nearly 1,000,000 persons in 1,428 plants.**
- **More than 1,300 engineers employed in all fields of engineering activity.**
- **The executives' questionnaire went to top management in small and large plants.**
- **The engineers' questionnaire went to professional workers in job categories ranging from field clerk to supervisor.**
- **Fields covered include manufacturing (45 percent), construction, heavy industry, public utilities, government service, teaching and research.**
- **Forty-seven percent of respondents are employed in plants with more than 1,000 workers; 33 percent work in shops with less than 200 employees, and 20 percent were from medium organizations with 200 to 1,000 employees.**

Another effective method for promoting continuity of service—one which long has been used by the larger corporations and which is now being inaugurated on an increasingly widespread scale by smaller firms—is the profit-sharing or stock bonus plan.

One of the most interesting is the stock-purchase plan used by the Sun Oil Co., of Philadelphia and Marcus Hook, Pa. There all employees are permitted each year to buy stock in the company in an amount equivalent to 10 percent of their annual pay at the average price per share prevailing over the previous quarter.

The company then adds, in stock, 50 percent of the employee's purchase, so that he actually obtains the securities for two-thirds of their real value.

The significant provision in the plan is that although dividends start at once and are payable to the employee as soon as they are declared, the actual transfer of title to the stock certificates does not take place until one year after the purchase has been accomplished. If the employee leaves the company during the year, he is refunded the amount he paid in, but his shares, along with the company's 50 percent stock contribution, go into a stock pool which is divided at the end of the year among the other employee stockholders, on a pro rata basis, as a bonus.

"It's worth real money to stay on the Sun payroll," said one engineer in their Marcus Hook refinery. "Last year, for instance, I bought 10 shares of company stock, to which the firm added another five. But at the end of the year, I got another 10 shares and these were free as a distribution from the pool.

"Actually, therefore, I received 25 shares for the price of 10, and that is worth sticking around for!"

Paul Woodrow, personnel manager at the refinery, thinks the stock purchase plan is one of the most important of the firm's incentives from the standpoint of retaining professional talent for long periods of service, along with the pension plan which is paid for entirely by the company.

"Taken together," he said, "these two plans give them a very real sense of security, and that seems to be the primary goal of most of them nowadays."

Sun also has an extensive training program in which newly-employed engineers are rotated in various jobs until they "find themselves," and additional programs are designed to assist professional personnel in fitting themselves for the better jobs that most of them look forward to.

How "Professional" Is the Young Engineer?

- **Most executives think his attitudes "unprofessional"**
- **But they recognize his professional standing**

Sixty-two percent of the executives surveyed felt that the young engineers' attitudes are unprofessional. One executive said "men do not feel like professionals when they are paid less than skilled labor," and others said that a professional attitude is gained only by experience. On the other side of the fence, though, only 29 percent of the engineers queried said they do not feel their companies recognize their professional status. While the engineers in this dissatisfied group are a minority, still it is a large enough group to worry about.

Whether such a condition exists

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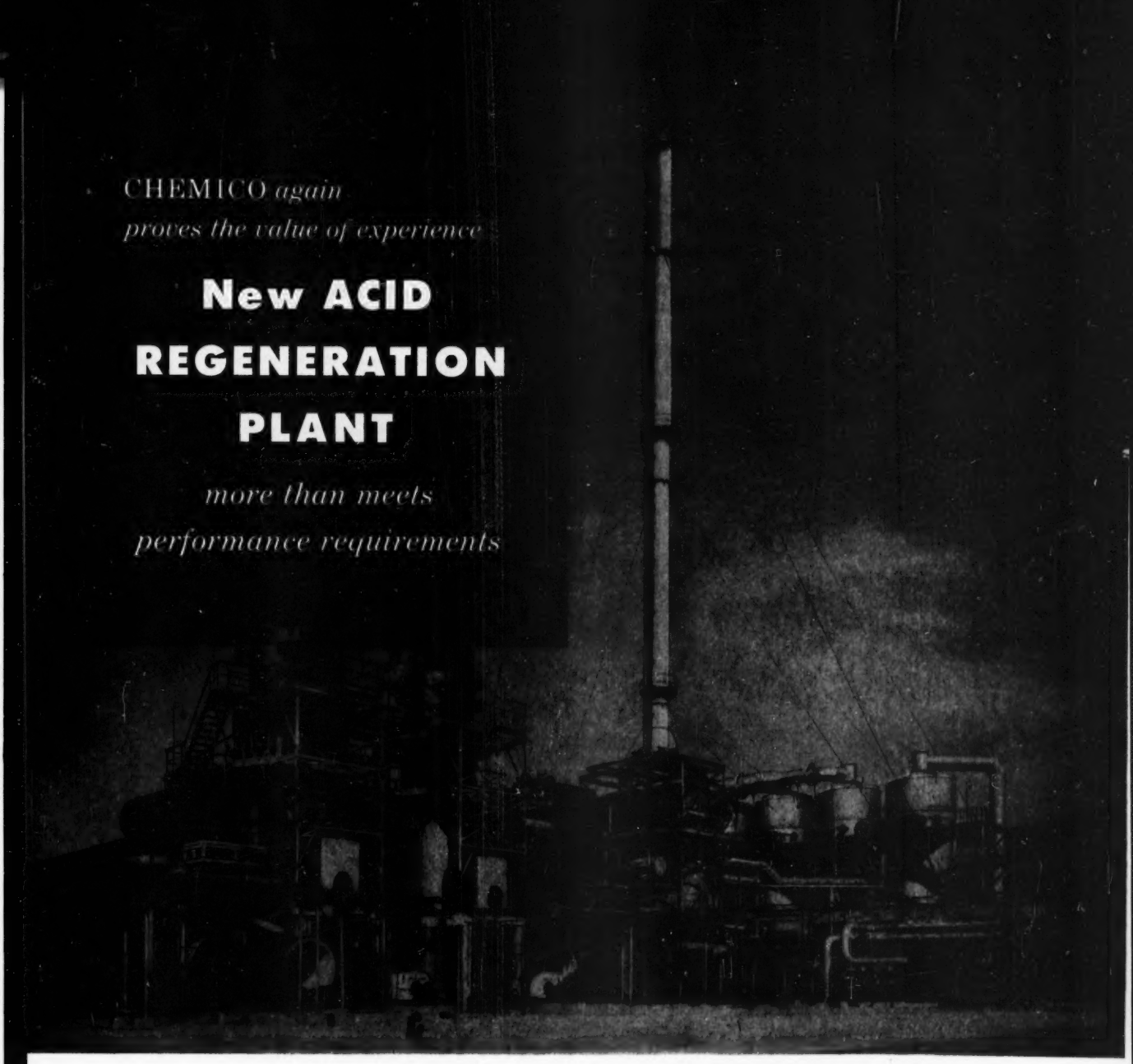

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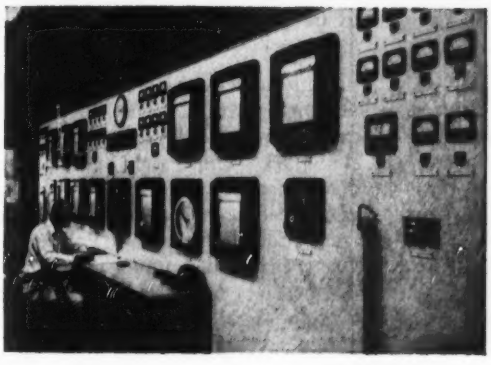

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it is evident that the lines of communication need overhauling. The report suggests seminars where management can explain its economic problems to the engineer and the engineer, in turn, can do a better job of selling management on his importance. A greater participation by engineers in planning and other management functions might also help ease the situation.

Many companies have found it helpful to encourage all of their engineers to become registered, and to participate in the activities of professional organizations. More than 85 percent of the firms grant time off for registration examinations, a number of those also pay expenses incurred in connection with those examinations, and 43 percent pay initiation fees or dues in professional societies for at least some of their engineering employees. Besides these techniques, job assignments for the engineer should be as varied as possible so as to develop in him a greater breadth of understanding concerning the company's activities, and fit him for greater responsibility.

What Makes a Job Good?

- **Benefits loom large only if you don't have them**
- **Incentives are pretty darned important**

What part do benefits play in the attraction and retention of engineers? The answer to this survey question was the same in every case:

"None, except from a negative standpoint."

Because virtually every large plant, and most smaller ones as well, now offer such benefits as group hospitalization, low cost insurance (or in some cases, policies paid for entirely by the company), pension plans and elaborate recreational facilities, they have ceased to be inducements from the standpoint of recruiting.

But the company that does not offer them is at a disadvantage, both from the standpoint of recruiting and of keeping its employees happy once they get on the payroll, for those benefits represent extra dollars and cents in the pockets of the employees and security against emergencies.

Incentives such as unusual opportunities for training and advancement professionally are much more important, according to the survey respondents, first because they are vital rather than static factors, in which the employee plays the vital part, and secondly, because they are not offered on nearly so widespread a basis.

Do Engineers Want a Union?

- **66 percent said "No"; only 3 percent now belong to one**
- **But 66 percent call for a non-bargaining organization**

Union organizational activities present no serious problem to the employer—at least insofar as the engineers are concerned. Only eight percent of the companies surveyed, reported that they had been the targets of any organizational activity.

The fact that so high a proportion of engineers (34 percent) favored unionization, though, marks a trend which, if it continues, could grow into a major problem.

Of the executives who said their plants had been the scene of union activity, 29 percent said such activity had affected them adversely with respect to their ability to recruit and hold competent engineering personnel.

This was especially true, they said, of recent college graduates, few of whom would take employment with a unionized plant.

The evidence that recent college graduates do not favor unionization was pointed up by the fact that of the 34 percent of engineers who believe in collective bargaining agencies, few came from the group which had been graduated within the last two or three years. Most of them, however, fell within the 25-35 age group.

When it came to a question of non bargaining organizations, however, age did not seem to be a factor. Sixty-six percent of the respondents, representing a fairly accurate cross-section of the group from the standpoint of age, said they favor such an organization within the company "for the purpose of establishing a medium for interchange of ideas and improving communications with management."

Several among the 34 percent who voted "no" explained their negative opinions with the assertion that "all too often" such non-bargaining organizations can be swung into the union fold by a small but active minority of pro-union sympathizers, and that "I'm not having any."

Approximately 10 percent of those surveyed work in plants where the engineers have a non-bargaining organization. About 80 percent of that group belonged to their company organizations.

The possibility of widespread, vigorous union organizational activity among engineers is, at the moment, a slight one, but there has been an alarming increase in the number of engineers who consider unionization in a favorable light.

With regard to acquiring new engineers, the survey was quite articulate, too.

Portrait of Engineer Surveyed

Although the engineers surveyed range in age from 21 to 80, the bulk of them were chosen from the lower age group because it is the younger men whom industry now seeks to attract—and hold.

Our typical engineer, therefore, is 35 years old, has been an engineer for nine years (with time out for military service), and has worked for his present employer, a large manufacturing company, for six years. He is one of more than 200 members of the firm's engineering force; he does most of his work in an office, but gets into the field occasionally, and he supervises five other persons.

He is not an adventurous type and wants to stay with his firm. He likes his work, but he is inclined to be unhappy about his salary and his chances of advancement. He doesn't know quite how he stands with his company, and he feels it isn't making as effective use of his training and abilities as it could. He is employing only a part of his working day on purely engineering tasks, and he likes it that way . . . but he wants recognition as a professional and doesn't think he is getting it to the degree that he should.

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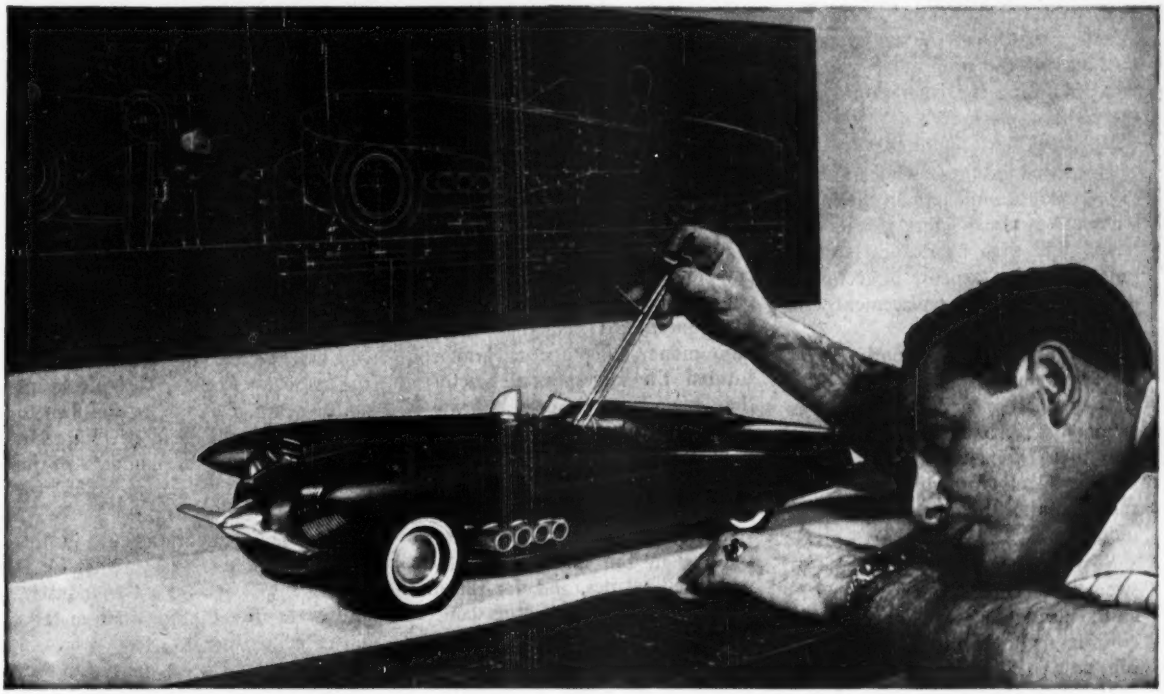

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The "Rights" and "Wrongs" of Recruiting

- **Don't paint too rosy a picture of the job**
- **Don't be fooled into thinking money isn't important**

The survey questionnaire circulated to the engineers tells the story. To the question: "Was your first job actually as it was described to you at the time you accepted employment," 20 percent answered "no." Most of the members of that group were younger members of the profession, who entered it during the labor shortage of the last few years.

But even more significant:

Nearly all of those who answered "no," today are unhappy in their jobs. They are candidates for "greener pastures," and their companies face the potential added expense of recruiting and training new replacements for them.

Many of them, after months of routine work on a drafting board or in testing, analysis or computation assignments, are bored, and do not feel that their companies are making use of the talents for which there was such frantic bidding only a few months before.

So they themselves, with their answers to the survey questions, indicate all too clearly that such flamboyant recruiting tactics pay off, in the long run, only in the coin of discontent.

Here is the evidence:

Q. Do you feel your company recognizes your professional status? 29 percent answered "no."

Q. Do you feel your company is making effective use of your training and ability? 38 percent answered "no."

Q. Are you satisfied with your present job with respect to salary, prospects, nature of work, working conditions and location of work? 38 percent answered "no" to two or more factors.

And each of these "no" groups included most of those who felt they had been oversold on their jobs.

There is a large body of personnel people who sum up their most successful recruiting practice in one word:

MONEY.

Although there were varying degrees of literary ornamentation, that is the way a large number of the executives answered the survey question: "What inducements or techniques has your company found most effective in recruiting new engineering employees?"

Answers to other survey questions lead indisputably to the conclusion that the engineer's rate of pay becomes one of the most important factors in keeping him contented, if not the most important, after he gets over his apprenticeship and the attendant glamour of entering a new profession.

BETTER OFFERS

Although engineers in general today are enjoying the highest rates of pay in history, a majority of executives questioned said that offers of more money by competing firms constituted the largest single factor in their engineering turnover.

This apparently is true, however, only of the engineer who has been in the profession long enough to have acquired a wife and family, since the younger respondents—the engineers in training—in the main were satisfied with their salaries, and, for the most part, with all other factors concerning their jobs.

It would seem, therefore, that money is not quite so important a factor in recruiting as some of the younger and more aggressive companies believe.

The older, established firms seldom have found it necessary to engage in the competitive antics resorted to by a few of the newer, fast-expanding plants which have mushroomed on war contracts and find themselves facing an ever-growing need for professional help.

One thing that should be avoided at any cost, though, is overselling the job.

Many companies have found that one of their most successful techniques is the practice of recruiting top students during their junior year and giving them temporary employment with their engineering group during the summer before they reach their senior year.

This not only gives the student a clear conception of the work which will be expected after graduation and the company a chance to evaluate his abilities, but it also helps the firm to take some of the load of semi-technical work off the shoulders of its engineering staff and free them for purely engineering work.

But most important, it insures that the graduate knows what he is getting into when he enters industry, and is prepared for the routine tasks which come along.

And what of the schools. Do they do their jobs?

How Well Is the Graduate Trained?

- **He needs more English, Humanities, Business Training**
- **Without these, he'll soon reach a dead end**

Eighty-eight percent of the executives felt that the engineering schools are turning graduates out with an adequate background in science, but a majority (62 percent) felt that these newcomers to the engineering ranks were sorely deficient in other areas of study.

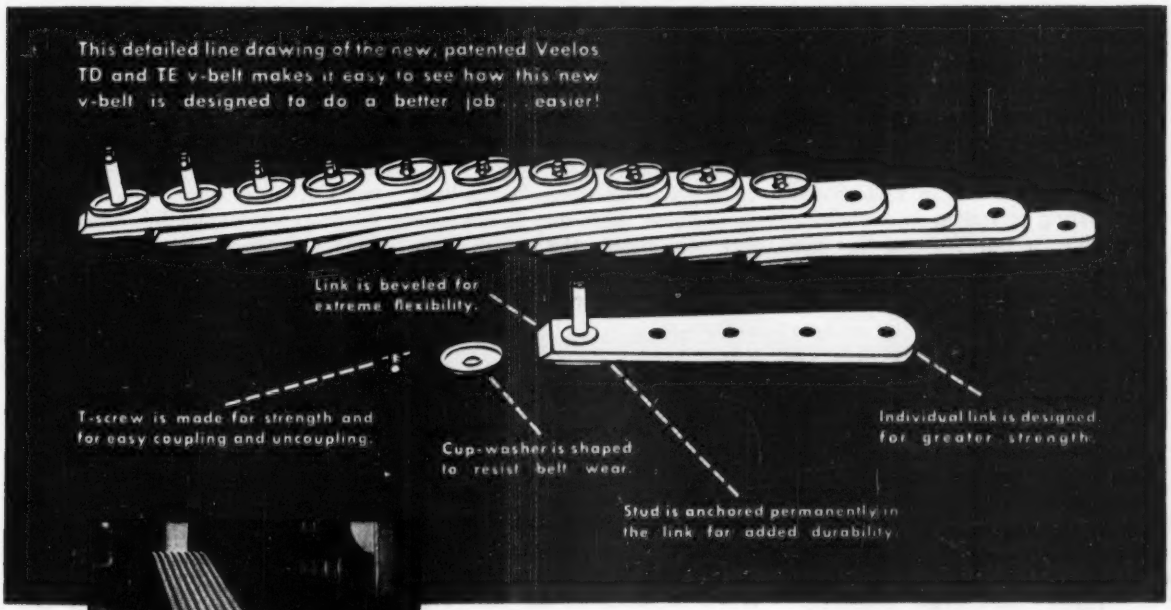
The engineers themselves indicated a recognition of that deficiency. Twenty-eight percent of those who replied said they did not feel that their collegiate training prepared them adequately for a career in engineering, and most of those indicated a need for "more work in English, the social sciences and business administration."

English stood high on the list of subjects on which the executives felt more emphasis should be laid by the colleges.

"We are getting too many young men whose narrow training fits them for nothing better than technicians' jobs," said one.

"They know the engineering principles thoroughly. They can analyze a problem and come up with the right solution. But they don't know how to put their ideas into words, either orally or on paper.

"Such a man can be valuable in a subordinate capacity, but he isn't going very far, in the long run, and it usually doesn't take him long to discover his own inadequacy, and to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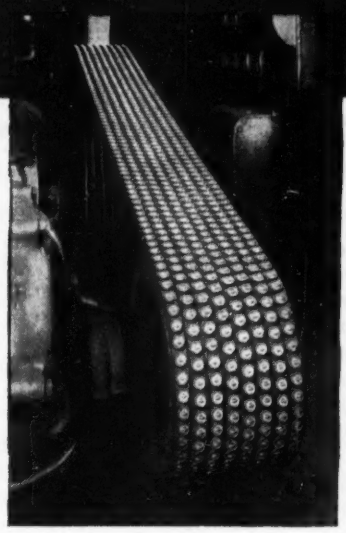

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resent it. And, frequently, he directs that resentment toward his superiors or his fellow workers, and the first thing you know, we have a morale problem.

"It seems to me that we in industry are doing ourselves, as well as the engineering profession as a whole, a disservice in not insisting that the colleges offer well-rounded programs which will turn out not just engineers, but educated engineers."

A number of executives, among them, Thomas F. Edson, assistant vice president of the American Potash Corp., Los Angeles, suggested as another expedient that leaders in industry offer their services to the colleges as instructors in short courses on engineering subjects, and on such non-technical matters as human relations.

"Young engineering graduates," said C. A. Butler, Jr., engineering director of the Diamond Alkali Co., Painsville, Ohio, "usually are lost when problems arise involving human relations, or ones which must be solved without detailed facts."

"They should be stimulated," he said, "to the development of more imagination and greater curiosity, and taught to place less reliance on textbook data."

To sum up, The Engineers' Conference Board for Industry and the National Society of Professional Engineers have turned-up some eye-opening indictments against the engineer and against his employer. In some cases, there is evidence of downright hostility between the two groups. Communications need overhauling to be sure. Teachers, executives, engineers—all three will have to work hard at their relationships with each other. The NSPE report sets up a clear target and provides some of the weapons. The rest is up to you.

The complete report, "How to Attract and Hold Engineering Talent," will be available from the National Society of Professional Engineers, 1,121 Fifteenth St., N.W., Wash. 5, D. C. Price: $1 members, $2 non-members.

INSTRUMENTATION

. . . Goal: An Ant's Brain

Most of the Mississippi River would probably be needed to get enough water to cool an electronic "brain" as capable as the human brain.

And it would take a Pentagon-sized building to house the machine. The building would be crammed with wiring and tubes, and would use up as much electrical power as that consumed daily by a large city, servomechanism engineers at Minneapolis-Honeywell estimate.

Capable as electronic "brains" are, the engineers stress, they do not come close to matching the human brain. The most elaborate models may some day equal an ant's brain, however, they estimate.

CUT OPERATING COST

. . . With Low-Cost Survey

A small business as well as a large one can now use the techniques of the management engineer if not his services, to cut operating costs, according to Joseph A. Alexander, Director of Joseph A. Alexander and Staff, Management Consultants.

The approach is to let management solve its own problems through the use of a packaged "Survey Kit," offered by the Alexander organization.

The survey essentially, is a check list questionnaire covering employee morale and attitudes, supervision, wasteful practices, ownership structure, financial set-up, management adequacy, controls, office and operating methods, sales, taxes, distribution and practically everything else likely to effect profits.

The idea of the survey is to provide the many specific facts that a management engineer would need to do his work. When a company has thus stated its problem in writing, it is in a position to see where waste and inefficiency can be slashed. The company is then ready to: (1) correct its own inefficiency; or (2) call in a consultant to do a particular job. The questionnaire takes only a few days to complete and is guaranteed to save many times its original cost of $100.

EMPLOYMENT TRENDS

. . . For College Graduates

During September, the Midwest College Placement Association held its annual meeting in Milwaukee. This meeting was attended by representatives of about 143 companies actively interested in recruiting graduates of all kinds from the class of 1954. During the conference, a spot survey of these 143 companies was made under the direction of Philip H. Yost, Personnel Assistant, Connecticut General Life Insurance Co.

With regard to demand, the group was asked to compare their requirements for 1954 with those of 1953 in terms of "the same, more, or less." Fifty-two percent said they wanted the same number, 30 percent said they wanted more, and 24 percent said they wanted fewer. A year ago, figures on this same question were, 56 percent wanted the same, 33 percent wanted more, and 10 percent wanted less. These figures apply to technical graduates including engineers.

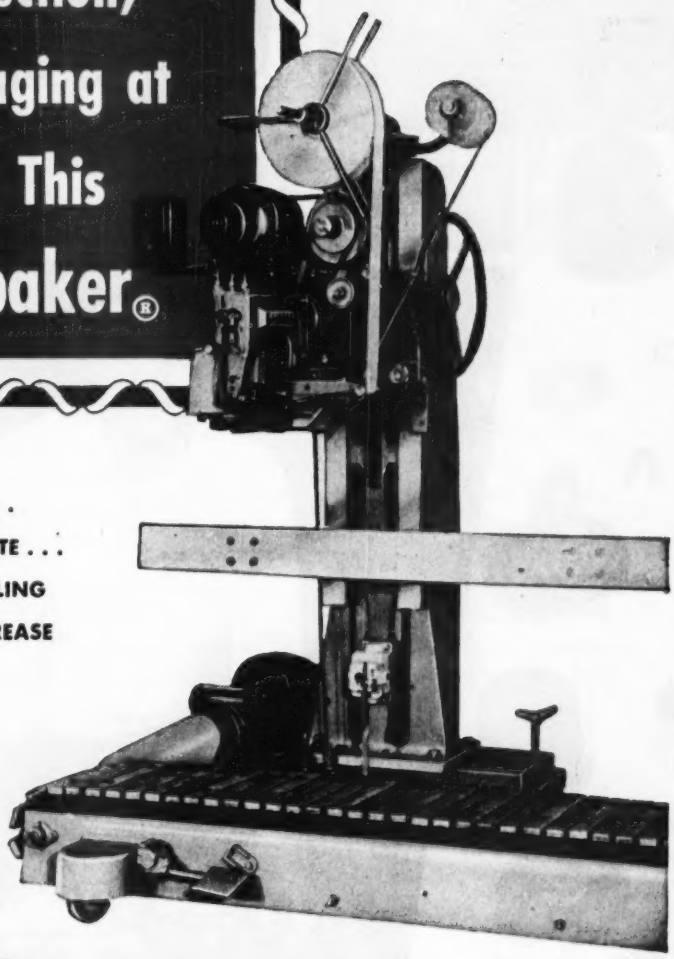
Regarding beginning salaries, the following question was asked: "As nearly as you can estimate, what will your 1954 gross salary offering be for men without previous business or industrial experience?" Eight percent specified a figure between $301 and and $325; 36 percent said between $326 and $350; and 44 percent placed a figure between $351 and $375. A year ago, the same question produced the following results: Forty-two percent between $301 and $325; 43 percent placed a figure between $326 and $350; and 6 percent were between $351 and $375. Seventy-seven of these companies reported they were offering the same salary in 1954 as in 1953, and 62 companies reported they would offer a higher salary. Not one intends to offer a lower salary.

They were also asked to report on the percentage of the number of men hired in 1953 compared to the number of men sought. Three companies reported that they hired between 0 percent and 25 percent of what they sought. Twenty-four company representatives hired between 26 percent and 50 percent of their quota, 24 hired between 61 percent and 75 percent of the men they sought, and 64 hired between 76 percent and 100 percent of their quota.

In evaluating these intentions and salary plans, keep in mind that the figures represent the intentions of 143 companies, many of whom are most active in campus recruitment. On this tack, it is also important to note that, judging from interviews already scheduled on college campuses, there will, apparently, be more active recruiting on the campuses in 1954 than in any previous year.

—Engineering Manpower Comm. Newsletter #47.

Get Better Protection, Faster Packaging at Lower Cost With This Model ET Bagpaker®



CLOSES OPEN-MOUTH, MULTIWALL PAPER BAGS SEMI-AUTOMATICALLY . . . TAPES AND SEWS 15 BAGS A MINUTE . . . TEAMS UP WITH YOUR EXISTING FILLING AND WEIGHING EQUIPMENT TO INCREASE PACKAGING EFFICIENCY

You don't have to scrap your present equipment to get *stronger*, more *economical* bag closures with this Model ET Bagpaker. One man—receiving bags from your existing weighing and filling set-up—applies creped "*kraft*" sealing tape over the bag end...sews a reinforced "cushion stitch" through both tape and bag ...and neatly trims tape...time 4 seconds or less. Dimensional drawings and detail information are available in Booklet ET-E-12 Write for your copy *today*. Bagpak Division, International Paper Company, 220 East 42nd St., New York 17, N. Y.

Model ET applies famous "Cushion-Stitch" over dry tape for sift-proof closure. Model E-1 applies "Cushion-Stitch" only, for use where sift-proofing is not essential.

Check These Model ET Bagpaker Advantages

- ★ 15 bags per minute with one operator when filled bags are continuously delivered to conveyor.
- ★ Quickly adjustable for bags of from 25 to 100 lb. capacity.
- ★ Completely portable. Mounted on casters, can be moved easily to various packaging stations.
- ★ Bag starts and stops sewing head when equipped with automatic sewing head control.
- ★ Hoopner No. 150 Heavy Duty sewing unit with automatic brake to prevent "coasting".

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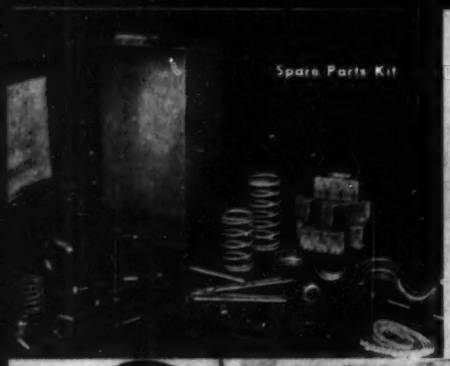
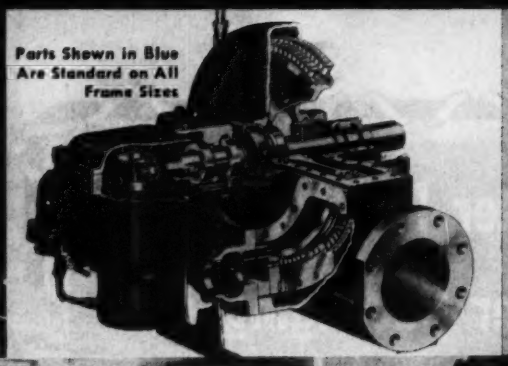
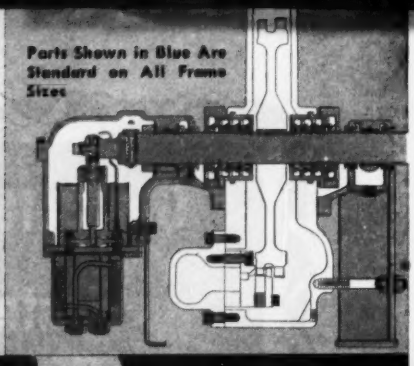






This display of interchangeable parts on G.E.'s Type DP turbine covers over 85% of the parts subject to wear—means you tie up less money in inventory.

ANOTHER PLUS VALUE OF G-E MECHANICAL-DRIVE TURBINES...

85% Interchangeability of Turbine Parts Means Less Money Tied Up in Inventory

Over 85% of the wearing parts are interchangeable among General Electric's Type DP Turbines—regardless of turbine rating. This means you don't have to tie up a lot of money stocking spare parts for each turbine; one set of parts protects a whole line-up. This feature alone can save you up to $100.00, even in installations of just two turbines of different sizes. Greater savings, of course, accrue as the number of turbines in the plant increases.

All of the parts, except for the governing end, are also interchangeable between G.E.'s Type DP Mechanical-drive Turbine and the Type DR which is designed for slightly wider speed range and greater horsepower.

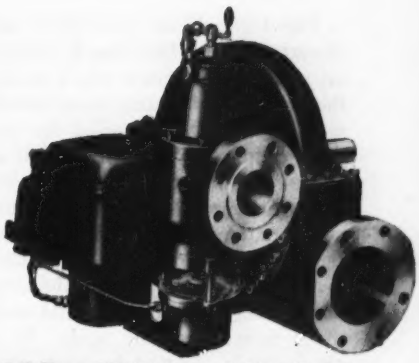
This interchangeability is just one of many DP features which save you money. The chart below indicates other areas of savings.

Remember—the total cost is often more than just the sales price. But G.E.'s standard DP turbines include the extra features that save you extra costs. For more information contact your nearest G-E Apparatus Sales Office. Write for bulletin GEA-4955A, "A New Standard in Mechanical-drive Turbines." General Electric Company, Schenectady 5, N. Y. 252-45

GENERAL ELECTRIC

INSTALLATION AND MAINTENANCE COST-SAVING FEATURES

THESE EXTRA FEATURES, STANDARD ON ALL G-E TYPE DP TURBINES, CAN . . .	Save You up to
COMBINED TRIP-THROTTLE VALVE Eliminate extra cost of buying and installing valve ahead of the turbine.	$200.00
SINGLE RESERVOIR FOR COOLING LUBE OIL Eliminate extra cost of piping cooling water to and between bearings.	50.00
MAJORITY OF PARTS INTERCHANGEABLE One set of spare parts protects several units—less money tied up in inventory.	100.00
METALLIC-LABYRINTH VALVE STEM BUSHING Eliminate labor costs of replacing soft packings; cut down-time production losses.	50.00
SHAFT MONEL-SPRAYED AT PACKING FIT Saves frequent cost of purchasing and installing carbon rings; contributes to long shaft and packing life.	20.00
ESTIMATED TOTAL SAVINGS	$420.00

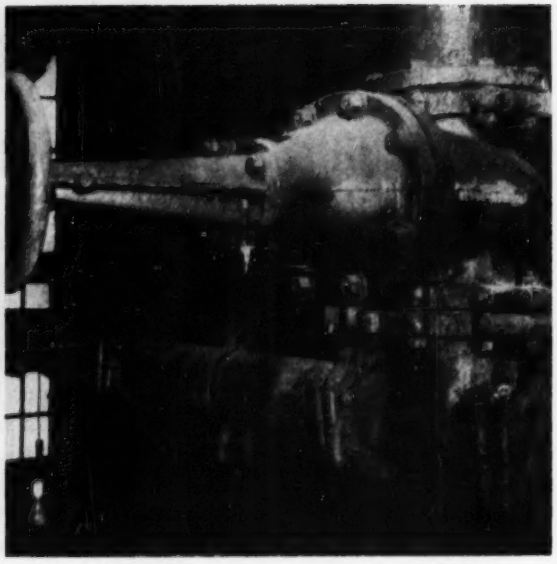


G-E Type DP Mechanical-drive Turbine

COMPARE THE FEATURES
EVALUATE ALL THE COSTS

See why G-E Standard Type DP turbines are your most economical buy.

Duriron pump handling boric acid solution. 10 years service.



Durichlor valve handling tin tetrachloride 10 years service.

High Silicon Irons

The corrosion resistance of these important materials of construction to a number of corrosives, with physical properties and applications in the chemical industry.

WALTER A. LUCE
The Duriron Co., Inc., Dayton, Ohio

The high silicon iron alloys are characterized by their nearly universal corrosion resistance which makes them adaptable to many exceptionally severe services not handled by any other commercially available metal or alloy. This unexcelled resistance includes the entire range of sulfuric acid concentrations to the various boiling temperatures, strong, hot nitric acid, many hydrochloric acid conditions often to high temperatures, and most other mineral organic acids. It is also suitably resistant to most other corrosives normally encountered. This excellent resistance to a wide variety of corrosives makes it the standard drain line material for laboratories, hospitals and engraving plants where a long service life is demanded. The only exceptions to this wide range of corrosive coverage includes hydrofluoric acid and the various fluoride containing compounds, sulfurous acid and sulfites. When suitably flushed with water, drain lines will withstand small amounts of these deleterious chemicals without difficulty. Strong, hot alkalis are also damaging to these alloys although they are suitably resistant under the more mild conditions.

Duriron and Durichlor are two high silicon iron alloys commonly used as chemical equipment. Duriron is a 14.5 percent silicon cast iron. Durichlor contains approximately 3 percent molybdenum in addition to the standard 14.5 percent silicon. The nominal chemical compositions for both alloys are given in Table I. The presence of molybdenum in Durichlor imparts a high degree of resistance to hydrochloric acid and various chlorine containing compounds and is much better than Duriron in this respect. Durichlor is equally resistant to all other corrosives but is normally not used because of its slightly higher cost. The percentage of silicon in these alloys is very important for best corrosion resistance. Fig. 1 illustrates that close manufacturing control is needed to assure good operating results. Duriron and Durichlor are given this close control.

Table I—Nominal Chemical Composition, Percent

	Duriron	Durichlor
Silicon	14.50	14.50
Carbon	0.85	0.85
Manganese	0.65	0.65
Molybdenum	Nil	3.00
Iron	Remainder	Remainder

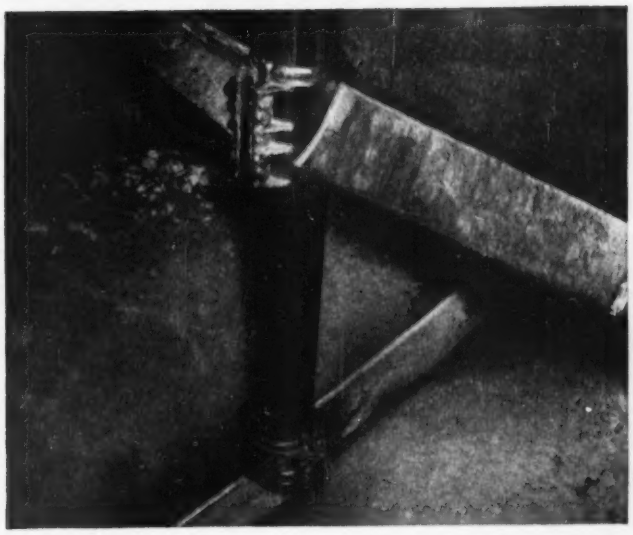
Mechanical and physical properties of Duriron and Durichlor are closely similar as illustrated in Table II. Although these alloys have a fair tensile strength, they resemble all cast irons in that they possess no ductility or elongation. In addition, they are susceptible to thermal and mechanical shock and in service must be handled with a reasonable amount of care. These limited mechanical properties

Table II—Mechanical and Physical Properties

	Duriron	Durichlor
Tensile strength, psi	16,000	16,000
Hardness, Brinell	520	520
Specific gravity	7.0	7.0
Melting point, deg. F	2,300	2,300
Thermal conductivity	0.125	0.125
Coefficient of expansion, 100–300 deg. F	7.33×10^{-6}	7.08×10^{-6}

These Alloys Can Really Handle Hot Acids

SAVES $25,000 A YEAR—Agitator sweeps and shafts made of HASTELLOY alloy B mix a corrosive and erosive mineral slurry containing 6 to 80 per cent sulphuric acid. The alloy's corrosion resistance has resulted in a maintenance saving of $25,000 a year.



←SAVES $5,000 YEARLY—HASTELLOY alloy C charging baskets have decreased maintenance by 90 per cent on this job. They resist oxidizing and reducing conditions caused by acid salts in a solution of hot sulphuric acid.

←4 YEARS IN HOT H_2SO_4 AND HCl
Propellers, shafts, thermometer wells, and blow-off lines formerly used on this dye kettle had to be replaced every three months. HASTELLOY alloy D parts used in the same severe service are still good after four years.

HASTELLOY *alloys can help solve your corrosion problems, too. For further information, contact the nearest Haynes Stellite Company office listed below.*

HASTELLOY *alloys*
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Nickel-base, corrosion-resistant alloys available as sheet, plate, bar stock, welding rod, welded tubing and pipe, cast pipe and pipe fittings, sand and precision-investment castings.

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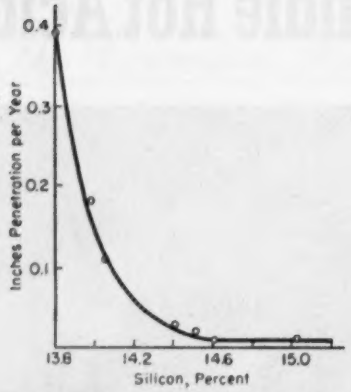

Fig. 1—Effect of silicon content of high silicon iron on corrosion resistance in 10 percent sulfuric acid at 175° F.

make it impossible to produce high silicon iron in the wrought form. It is, therefore, available only as castings and specific equipment made from castings. This equipment is designed to take advantage of the high compression strength of this material and is finding wide application in chemical plants because of its combined corrosion resistance and low cost. Extremely long service life as typified by the accompanying illustrations is common.

These to alloys can handle severe services at very high temperatures with little difficulty if large fluctuations in temperature are avoided. The units must be slowly heated and cooled to avoid shock and steam tracing is a means commonly used to achieve this result. Sulfuric acid concentrators which operate as high as 1,000 deg. F. contain large quantities of Duriron, and these operate with the severity of the surrounding conditions.

Duriron and Durichlor are available in a variety of cast forms for chemical plant work including pumps, valves, ejectors, fans, jets, pipe, fittings, anodes, strainers and tank outlets.

Heat exchangers, tanks, sections of towers, kettles and S-bend condensers are produced only in Duriron. Special castings can also be made although the intended application should first be reviewed by engineers trained in the handling of these alloys to make certain that potential difficulties that may be present are not overlooked.

With proper precautions the simpler forms of Duriron can be successfully welded. Chemical equipment is often fabricated by welding. The oxy-acetylene method is recommended using Duriron welding rod and a special flux. The flux can be made by mixing equal parts of lime and sodium bisulfite. For the average welding shop it is not practicable to weld intricate shapes such as centrifugal pump casings or valve bodies. Stresses are developed in the welding cycle which cause these intricate parts to crack. Prior to welding, the parts should be carefully preheated to approximately 1,600 deg. F and after welding, the part should be given a controlled slow cool.

By this means the residual stresses are maintained at a minimum. Durichlor is much more difficult to weld than Duriron and should not be attempted except after considerable experience. Before welding, either alloy it is suggested that complete welding instructions be obtained from the manufacturer.

The high hardness of Durichlor and Duriron make them very resistant to many severe erosion-corrosion services. Numerous instances are on record where acid slurries have been successfully handled with Duriron and Durichlor equipment. In most instances other metals and alloys with good corrosion resistance were applied and were found to be severely eroded. High-silicon iron pumps and valves have even been applied for relatively mild corrosive services where an abrasion problem existed. It should be pointed out, however, that it is not a universally erosion-resistant alloy, and there are a few particularly abrasive services which are capable of chipping the high silicon iron parts. These are most prevalent in certain digestion operations where large, hard, metallic or non-metallic particles are often encountered.

The accompanying charts provide detailed corrosion information on the high silicon iron alloys. Since 1912, when these alloys were first introduced in the United States, they have been extensively applied for handling corrosives. When first introduced over 40 years ago, Duriron was used for sulfuric acid applications, and it is still being extensively used in this service. It has also been widely adopted for many other corrosives either separately or in many combinations. Over this long period, extensive records have been maintained on actual service results and for the most part, these practical data are summarized into the accompanying charts. Although many of the data are from laboratory tests, they have been thoroughly checked with long experience in chemical plants, both as plant tests and as actual equipment. When interpreting plant results for these charts, it is often difficult to pin-point the correct range so in many instances a 0.002—0.020 ipy. rating was given despite a long service life for the material.

The corrosion resistance exhibited by Duriron and Durichlor depends on the formation of a passive film. This film takes a little time to form and the alloy may appear to be excessively attacked, but in those media where it is resistant, this attack will reach and maintain a uniform low value after a one or two day period. Thus it is advisable to test Duriron and Durichlor samples for a sufficiently long period to minimize this initial period of relatively high corrosion or to immerse the sample in the test solution for a short period prior to commencing the test. Fig. 2 illustrates the effect of time on the corrosion rate of Duriron. This is typical of many corrosives, particularly it is typical of the strong acids.

The accompanying charts for sulfuric acid, nitric acid and hydrochloric acid do not sufficiently illustrate the wide adaptability of these alloys. Therefore, the following comments will also be incorporated to illustrate their use.

SULFURIC ACID

Duriron and Durichlor are so extensively used in handling sulfuric acid in the process industries that it would be difficult to list all of the different applications. In the chamber process for manufacturing this acid, Duriron is used as pumps on Glover and Guy-

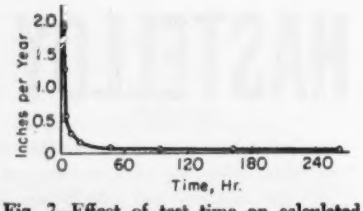

Fig. 2—Effect of test time on calculated corrosion rate of Duriron in 30 percent sulfuric acid, boiling.

Another leading manufacturer places its confidence in

DURCO

corrosion resisting equipment

Kodak

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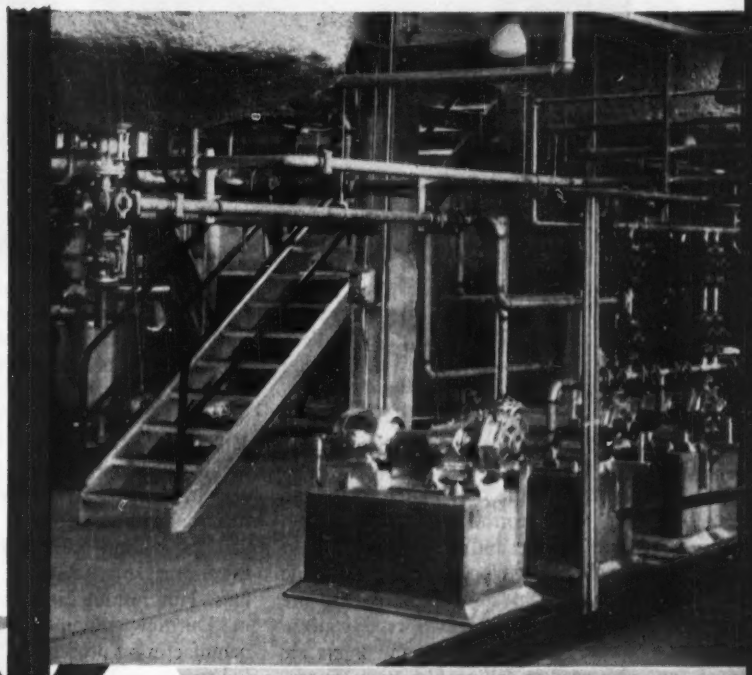
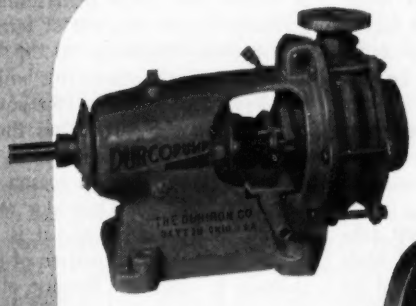


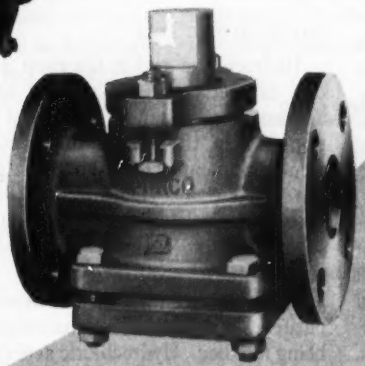
In their new Elon facilities at Kodak Park, Eastman Kodak Co. uses Durco corrosion resisting pumps and valves to handle crude Elon, a developing agent, in the various stages of purification.

Series R Durcopumps and Durco Type F valves *(both shown)* can be depended upon for long, trouble-free service. These heavy duty chemical pumps are available in 12 standard Durco alloys to provide the best possible service in various corrosive conditions. The Durco Type F valve is an easily operated, non-lubricated, maintenance-free plug valve. Built of Durco corrosion resisting alloys, with a Teflon®* sleeve, it has proved outstanding in hundreds of applications.

**Registered trademark of E. I. du Pont de Nemours & Co. Inc., for its tetrafluoroethylene resin.*



SERIES R STANDARD DURCOPUMP



DURCO TYPE F VALVE

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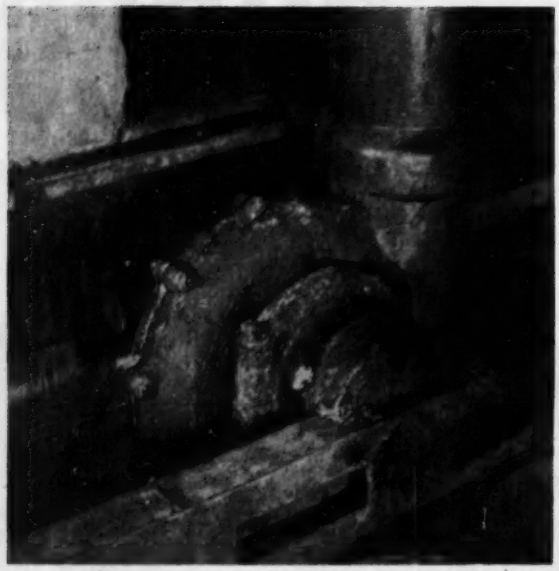
DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

THE DURIRON COMPANY, INC., DAYTON, OHIO



Duriron fan handling HNO_3 and H_2SO_4 fumes. 20 yr. service.

Durichlor pump handling zinc chloride flux. 5 yr. service.

Lussac towers, Glover tower outlets, valves of various types, pipe and other parts.

The concentration of relatively dilute sulfuric acid solutions involves very difficult corrosion problems, and Duriron is the only material showing very low corrosion rates. Duriron tubes, sleeves and Y-valves are used in the Mantius type concentrator; while pipe, fittings, and tank outlets are used in the Chemico type concentrators. Duriron tubes and liners are also used in falling film type concentrators. Pumps and valves are used to circulate this acid during the concentration cycle. High silicon iron is used extensively in other industries handling sulfuric acid such as fertilizer plants, steel processing (pickling solutions), explosives plants, ore digestion installations, electroplating and anodizing processes, and water treatment systems. Both Duriron and Durichlor are used for sulfuric acid slurries in the production of titanium dioxide pigments and for sulfuric acid solutions saturated with chlorine gas as would be encountered in the drying of this gas.

NITRIC ACID

Duriron and Durichlor have not found the same extensive application with nitric acid as with sulfuric acid because of the generally good resistance exhibited by stainless steels. However, when hot, strong acid and vapors are encountered, only high silicon iron will prove resistant. In the saltpeter process complete Duriron installations were used including retorts, denitrators, towers, condensers, coolers, pipe and valves. In the ammonia-oxidation process Duriron is also giving good service as concentrators, dehydrating towers, pipe, condensers, pumps, valves, tank outlets, towers, packing (Raschig rings) and fans. Hot, fuming nitric acid is cooled in Duriron equipment during the manufacturing process.

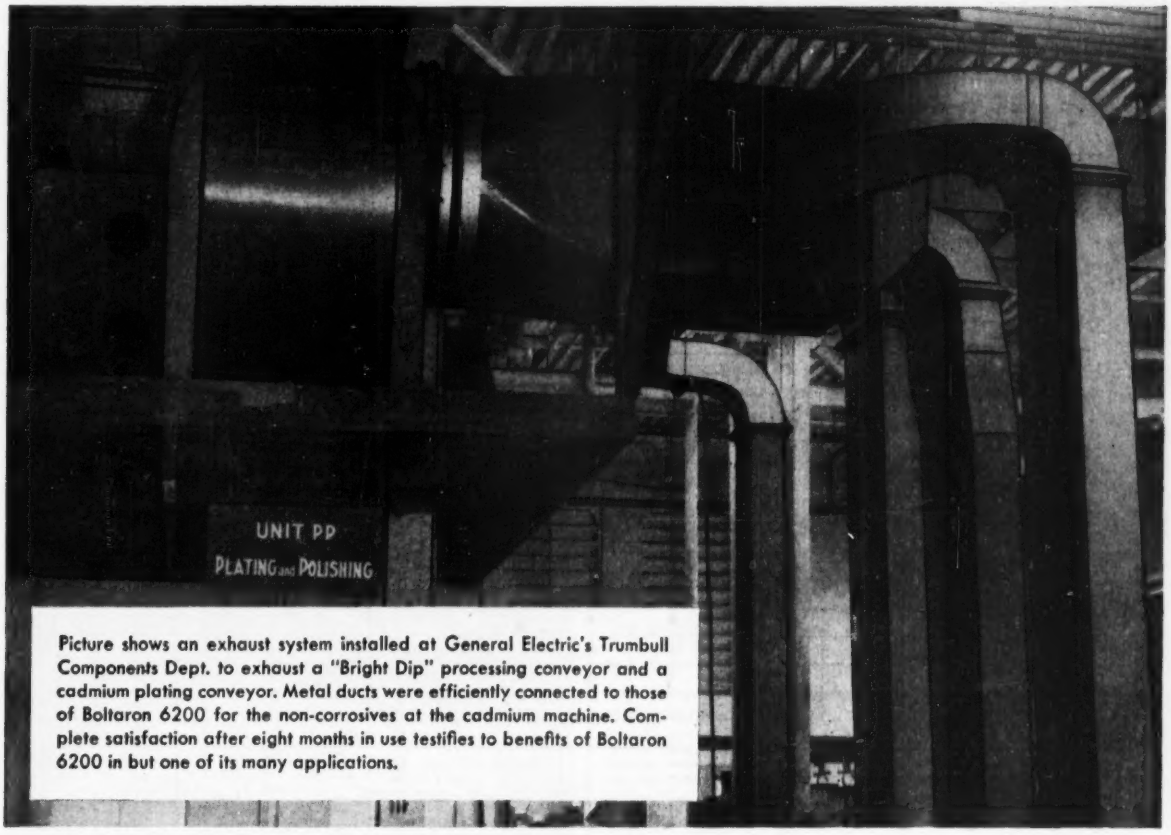
Duriron and Durichlor should not be used when hot, dilute nitric acid is involved. It probably would not be used because of the excellent resistance of stainless steel but this fact is worth noting. Combinations of nitric acid with other chemicals can be handled by Duriron equipment if the other chemicals are also resisted by the high-silicon iron.

HYDROCHLORIC ACID

Hydrochloric acid is the most difficult to predict of the mineral acids and in most instances care must be exercised in the use of high silicon iron equipment. Durichlor is the preferred alloy since Duriron will show acceptable resistance only for dilute solutions being handled at moderate temperatures.

The resistance of Durichlor depends entirely on the purity of the solution being handled. Hydrochloric acid containing even small percentages of ferric, cupric, mercuric or stannic chlorides is much more destructive to Durichlor than a similar solution relatively free from these highly oxidized metallic ions. However, all other commercial metals and alloys are attacked by hot hydrochloric acid containing these ions. From the practical standpoint Durichlor normally provides good service when transferring muriatic acid even at elevated temperatures.

Under these circumstances there is little chance for a build-up of a damaging percentage of these highly oxidized metallic salts. However, in a recycle service any corrosion of iron or copper base alloys soon results in a relatively great amount of ferric or cupric ions. Corrosion of the Durichlor part contributes to this build-up which in turn increases the rate of corrosion on the part. Thus the destruction of Durichlor may be self-imposed. It is for this reason that laboratory tests on Durichlor are of limited usefulness because it is difficult to prevent the formation of ferric chloride in solution. Because of this inherent difficulty in testing Durichlor in hydrochloric acid solutions in the laboratory the exact percentage of ferric or cupric chlorides which can be tolerated without reducing corrosion resistance is not known. It is normally recommended that if any doubt on the analysis of the solution exists that a sample of Durichlor be tested under actual operating conditions encountered in the plant.



Picture shows an exhaust system installed at General Electric's Trumbull Components Dept. to exhaust a "Bright Dip" processing conveyor and a cadmium plating conveyor. Metal ducts were efficiently connected to those of Boltaron 6200 for the non-corrosives at the cadmium machine. Complete satisfaction after eight months in use testifies to benefits of Boltaron 6200 in but one of its many applications.

PLANT LAYOUT SUPERVISOR REPORTS COMPLETE SUCCESS WITH *Boltaron* 6200

Unplasticized Polyvinyl Chloride

"A definite answer to replacement and maintenance problems on exhaust ducts and hoods for caustic or corrosive solutions," says Mr. G. R. Buys.

PLAINVILLE, CONN. In an eight-month performance report at the Trumbull Components Department of the General Electric Company here on this new unplasticized polyvinyl chloride, it was revealed that Boltaron 6200 has given "no evidence of breakdown or breakage due to rough treatment, while living up to every expectation." Completely corrosive-resistant and readily adaptable to hundreds of industrial and chemical uses, Boltaron 6200 continues to win wide acceptance and enthusiastic approval in plants across the country.

Boltaron 6200 is manufactured in the United States and is available in the following forms: *sheets* — size 30″ x 60″ (approximately), in thicknesses from 1/32″ to 1″; *rod stock* — (10′ lengths) ¼ to 2″; *pipe* — (10′ and 20′ lengths) ⅛″ to 4″; *fittings* and *valves* — standard, threaded I.P.S. sizes of ⅛″, ¼″, ⅜″, ½″, ¾″, 1″, 1¼″, 1½″, and 2″.

Whether your problem is in electroplating, anodizing or other chemical processing, investigate *first* the many advantages of Boltaron 6200. For more information and laboratory test results, write us direct.

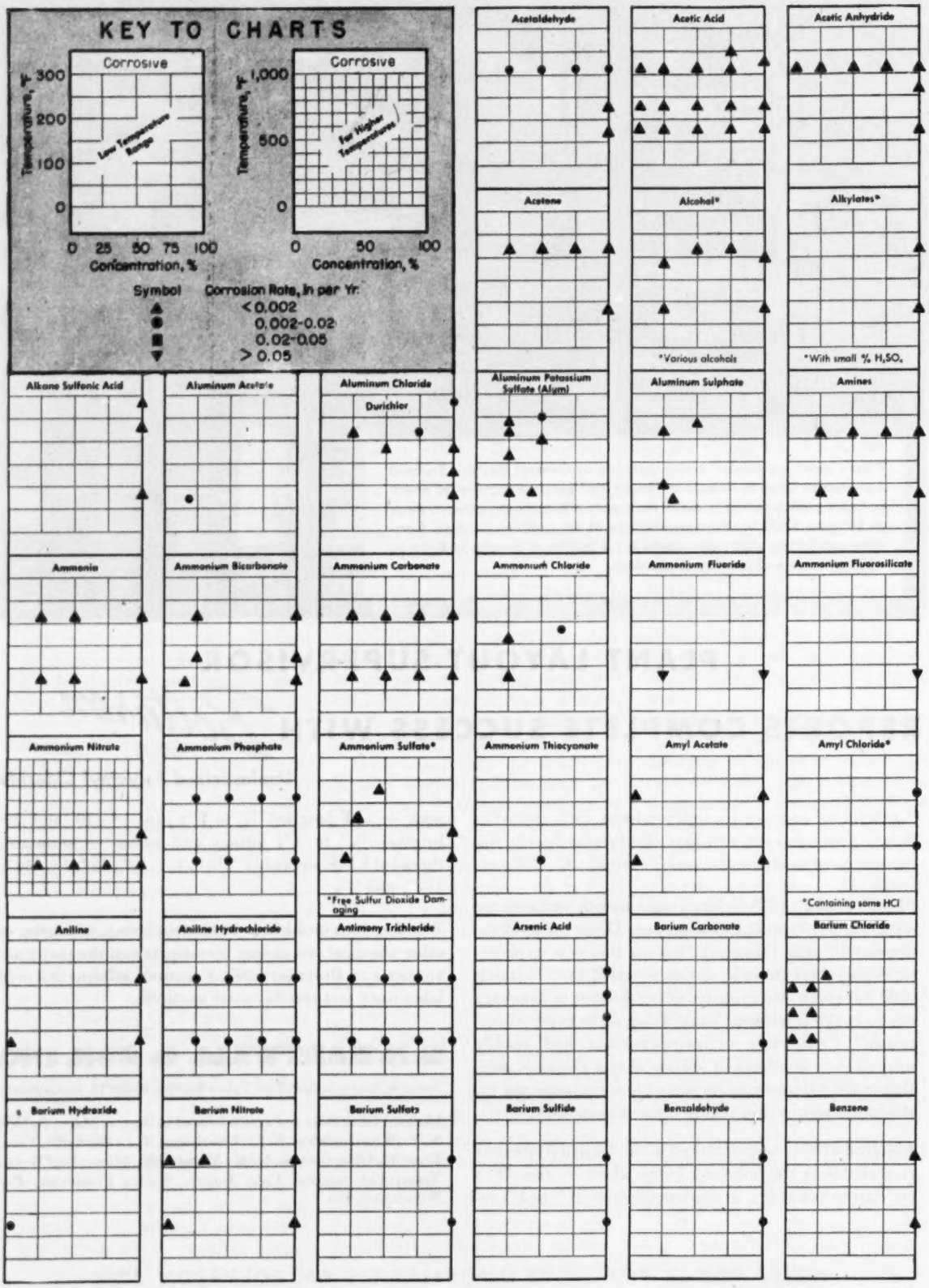
H. N. HARTWELL & SON, INC.

Industrial Plastics Division, Park Square Building, Boston 16, Massachusetts

Licensed fabricators and agents located in Boston, Mass.; Buffalo, N. Y.; Winston-Salem, N. C.; Hawthorne, N. J.; Knoxville, Tenn.; Byesville, Ohio; Owosso, Mich.; Minneapolis, Minn.; Fort Worth, Texas; Los Angeles, Cal.; Seattle, Wash.; Pittsburgh, Pa.; Wilmington, Del.

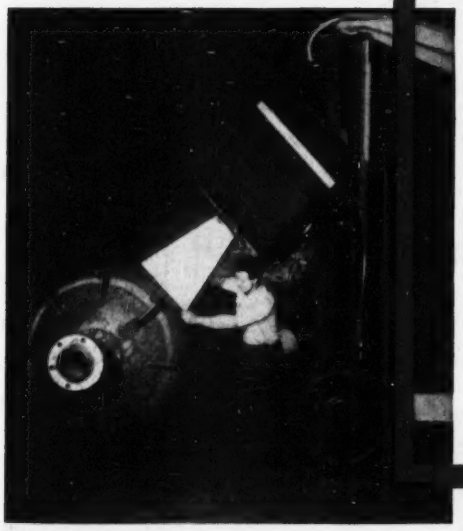
WRITE TODAY FOR MORE INFORMATION ON BOLTARON 6200

Corrosion Resistance of High Silicon Irons

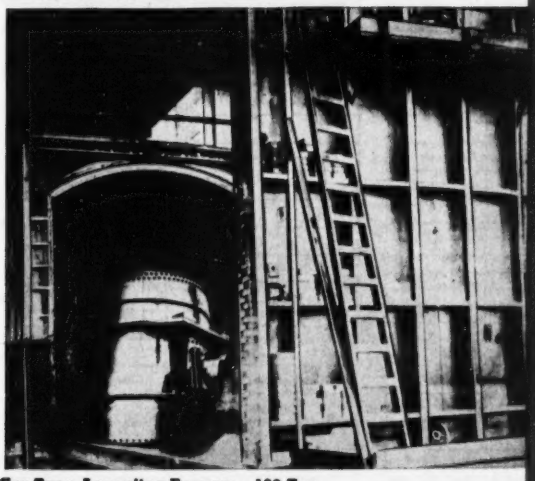


(Continued on page 254)

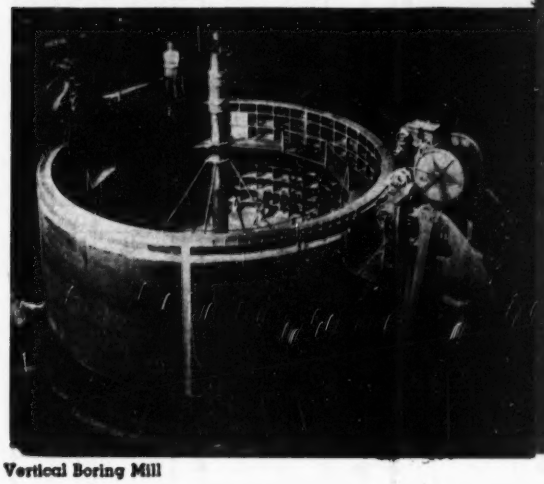
your equipment built in this plant • • • meets your most exact specifications



X-Ray Inspection Equipment



Car Type Annealing Furnace—100 Ton



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Over 40 years experience goes into your equipment when you place your contracts with Treadwell. From the smallest experimental vessel to gigantic columns, the Treadwell organization is ready to serve from drawing board to plant site.

Let the Treadwell staff accept responsibility for the custom work in your new capacity or modernization program.

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Four modern fabricating machining and erecting aisles covering a 300,000 square foot floor area.

A complete machine shop including a 35 foot boring mill and 14 foot planer with 40 foot table.

Welding facilities including acetylene, arc, and atomic hydrogen.

Car type zone control annealing furnace, 17 6 x 17 cross section by 55' long—capacity 100 tons.

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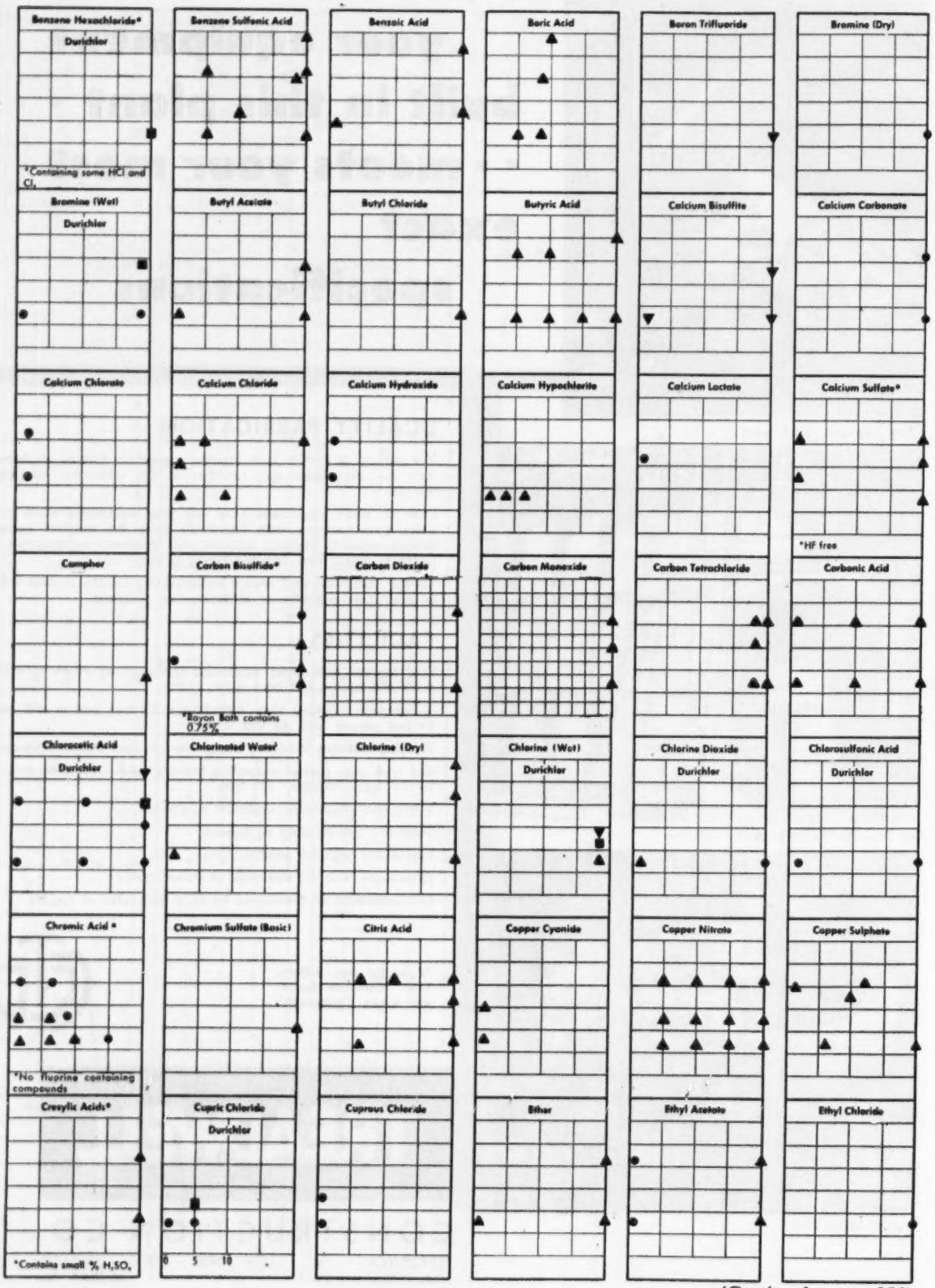
Corrosion Resistance of High Silicon Irons, *cont* . . .



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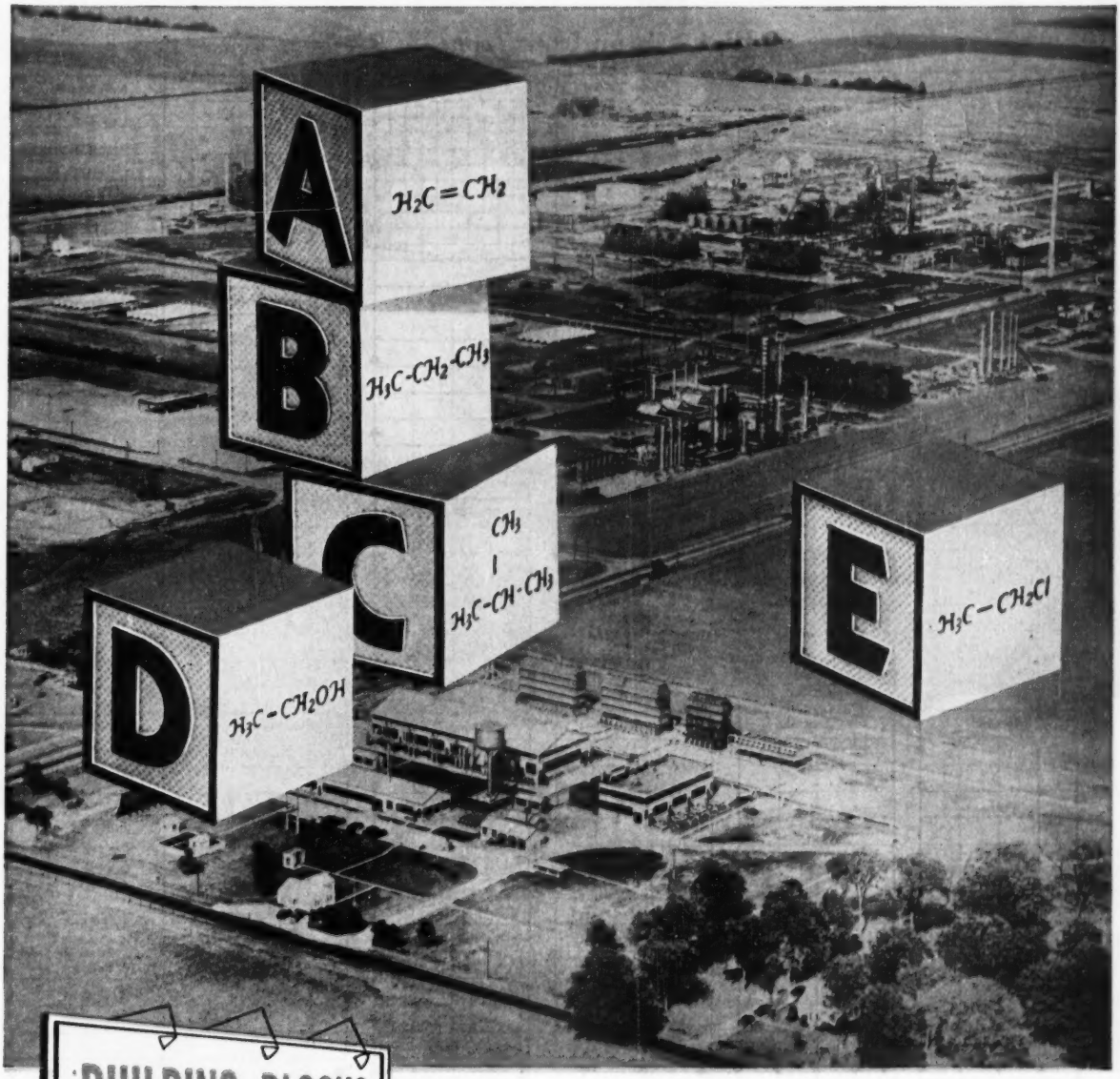

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Petro-chemicals, such as ethyl alcohol and ethyl chloride are now available from this new "Petro" plant near Tuscola, Illinois. Polyethylene production will begin early in 1955.

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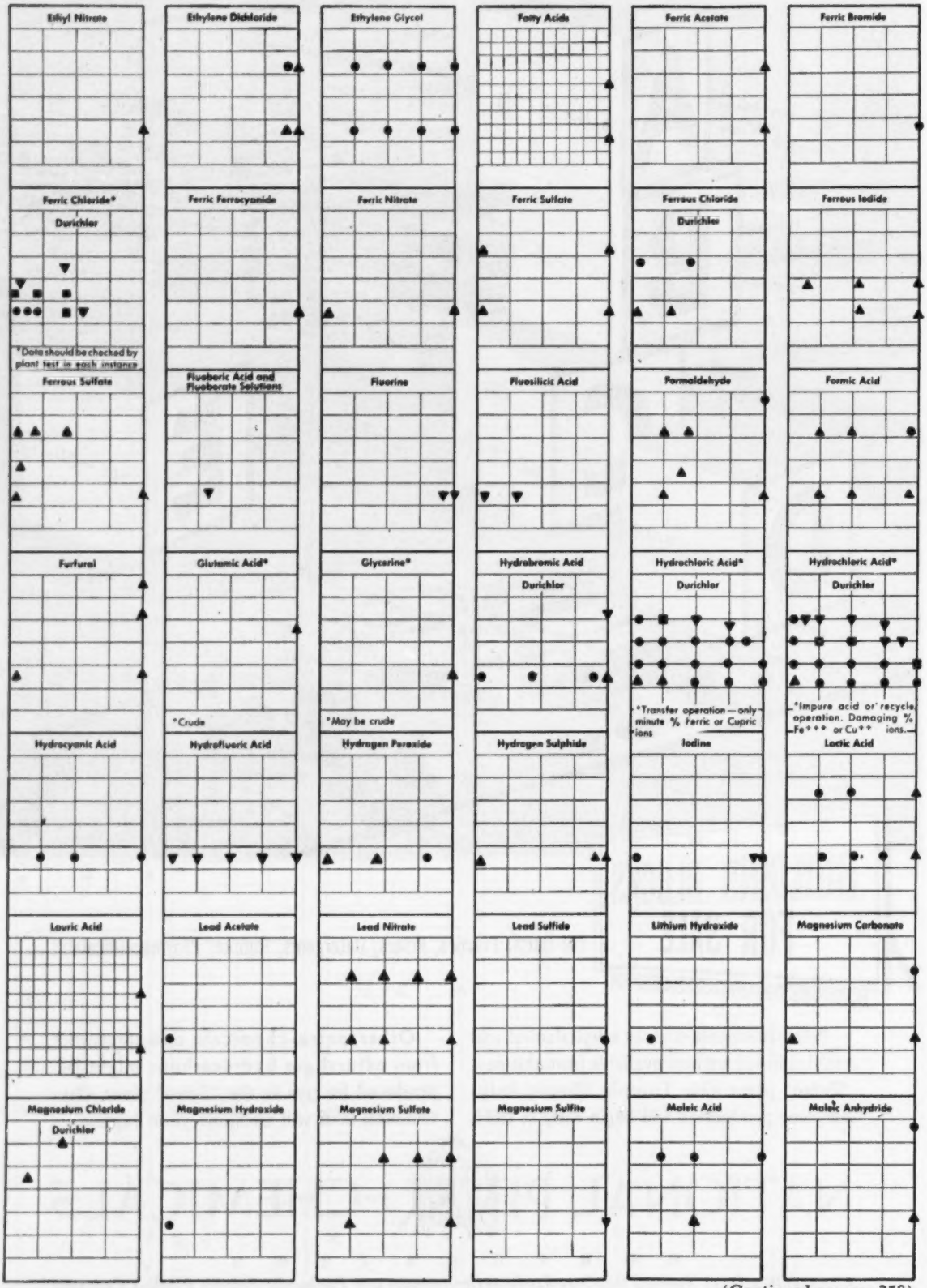
Corrosion Resistance of High Silicon Irons, *cont* . . .



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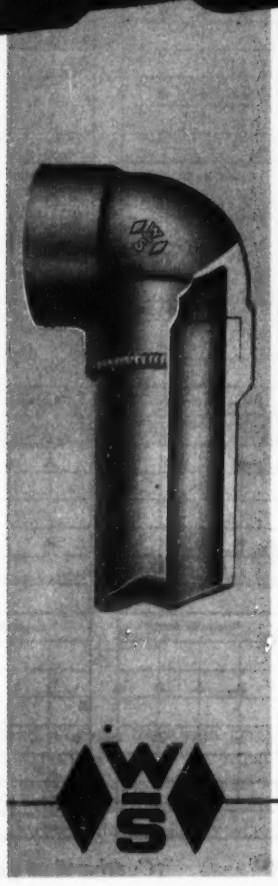
Half the Welding Skill is in the Fitting...



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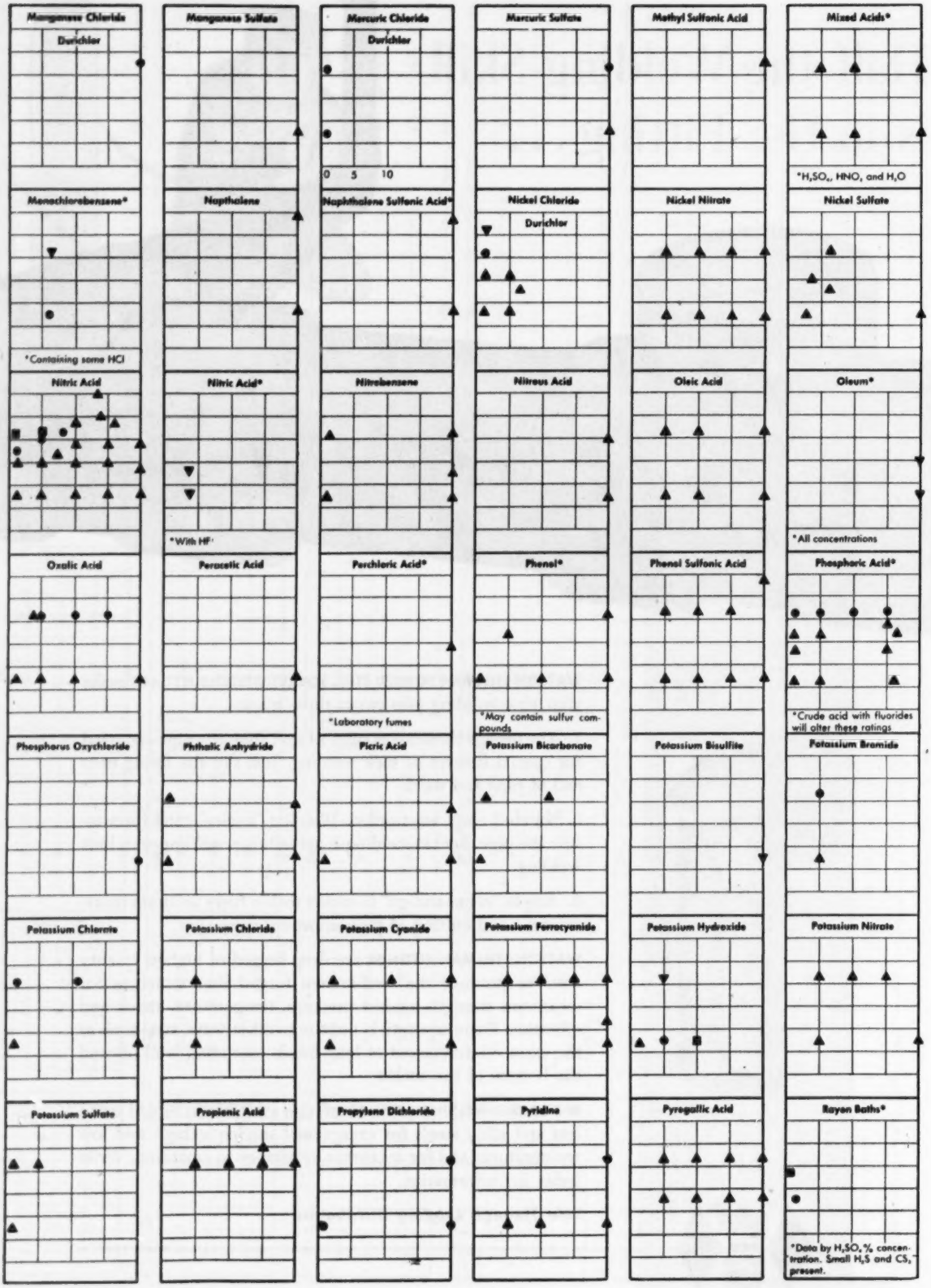
Corrosion Resistance of High Silicon Irons, *cont* . . .



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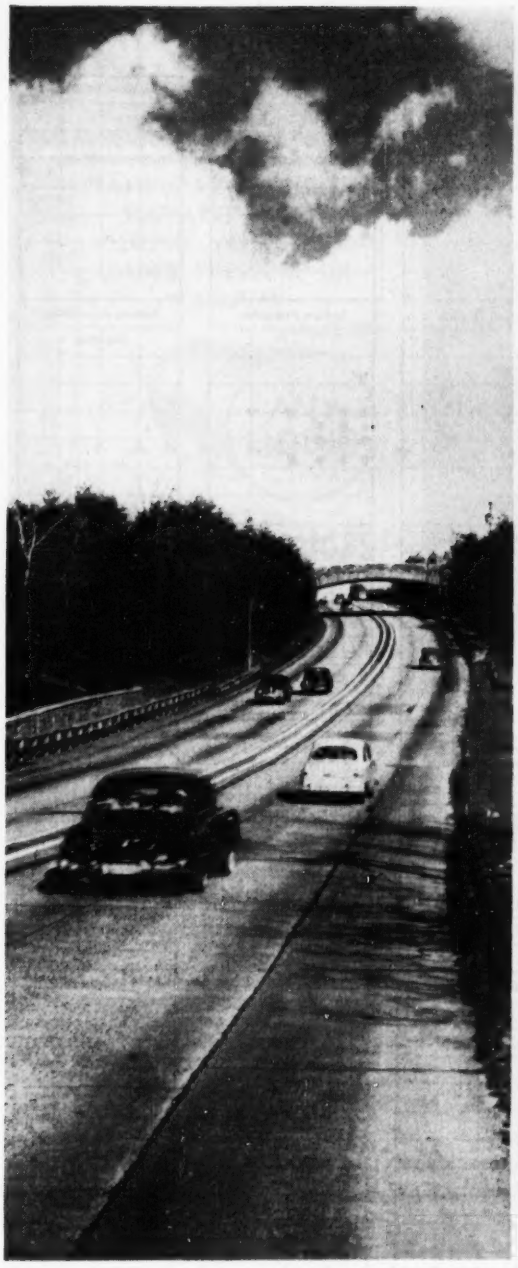
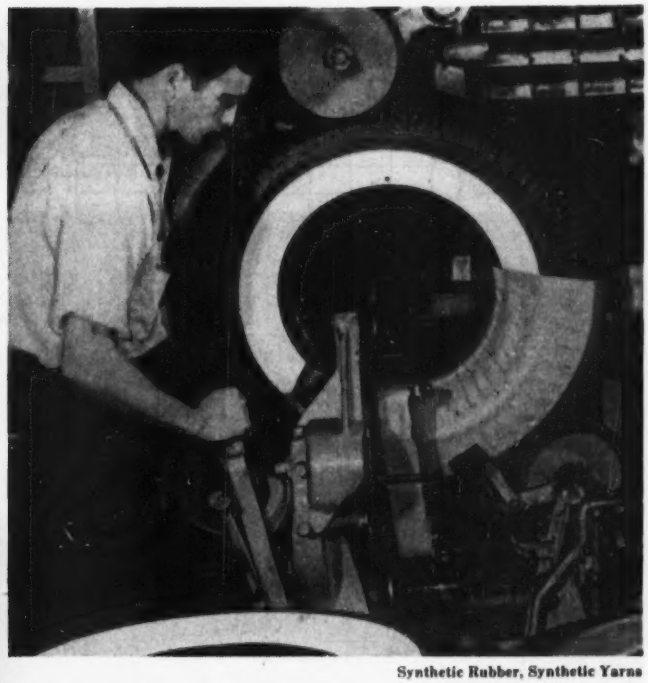


Motor Oil and Gasoline (Additives)



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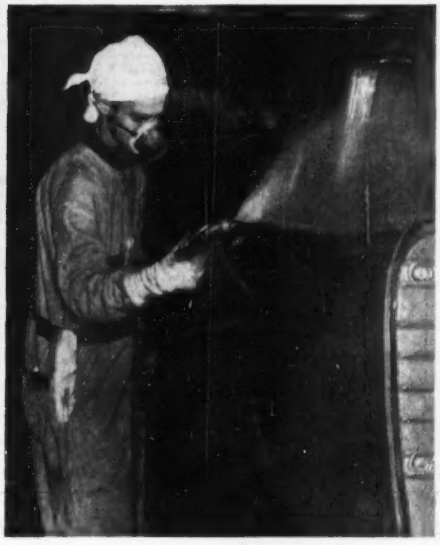

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Isopropyl Ether
Dicyclopentadiene
Naphthenic Acids
Iso-Octyl Alcohol
Decyl Alcohol
Denatured Ethyl Alcohol

CHEMICAL

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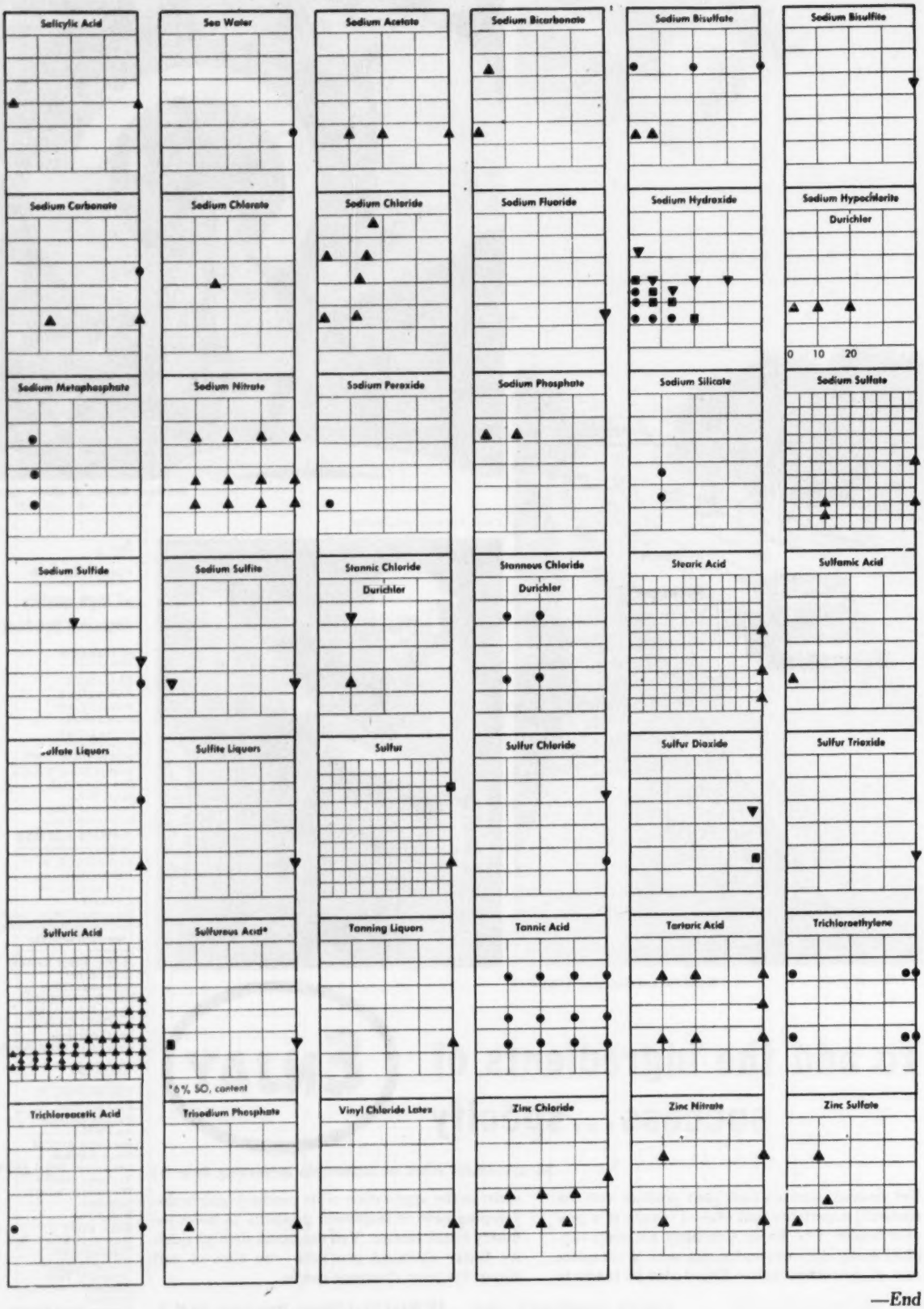
PETROHOL 95
PETROHOL 99
JAYSOL
Iso-Octyl Alcohol
Decyl Alcohol
Denatured Ethyl Alcohol
Tridecyl Alcohol
Dicyclopentadiene
Isoprene
Butadiene
Ethyl Ether
Isopropyl Ether
Tripropylene
Tetrapropylene
Aromatic Tars
Benzene
Acetone
Methyl Ethyl Ketone

Corrosion Resistance of High Silicon Irons, *cont* . . .



—*End*

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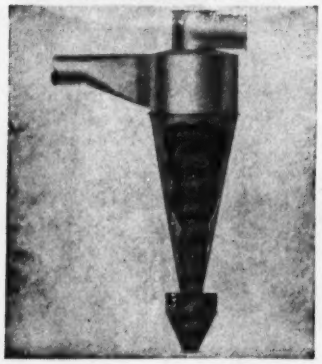
NEW BANISTER DUST COLLECTOR efficiently removes nuisance, toxic or hazardous dust



The Banister Dustmaster is a cyclone of modern design, incorporating big improvements in efficiency and working economy. It has application for removing nuisance, toxic and hazardous dust . . . thereby reducing equipment maintenance, increasing productivity, improving product quality, and maintaining a clean, healthful working atmosphere. Dustmasters also can be used for recovering valuable materials from dust, or as precleaners for filters and electric precipitators. Write A. W. Banister Co., Inc., 21 Charles St., Cambridge, Mass. for illustrated, 12-page Dustmaster catalog.

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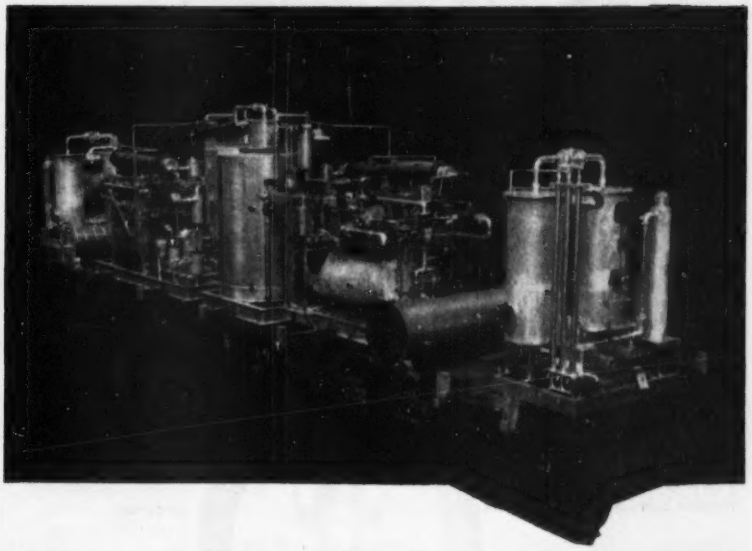

this single carload of equipment could save you $1.00 every two minutes

For concerns using any amount of gas sizable savings are possible simply by taking advantage of modern gas generation equipment. The customer's own figures prove that frequently these savings, in a single year, amount to more than the entire cost of the equipment.

For example, this recent shipment of gas generators and dryers went to a leading aircraft manufacturer who used nitrogen gas in his parts annealing. He formerly purchased his gas in cylinders at a cost of about $6.00 per 1000 cubic feet. These units tested out at 3000 cubic feet per hour each — producing the gas for as little as 18 cents per 1000 cubic feet. This amounted to a savings of approximately $5.82 per 1000 feet about $34.92 per hour, or 58 cents per minute.

Check your gas costs, and if you haven't looked into gas generation equipment it will pay you to do so as soon as possible. And when you do, keep in mind that Gas Atmospheres' high efficiency generators remain unsurpassed when it comes to product quality, high production and low costs.

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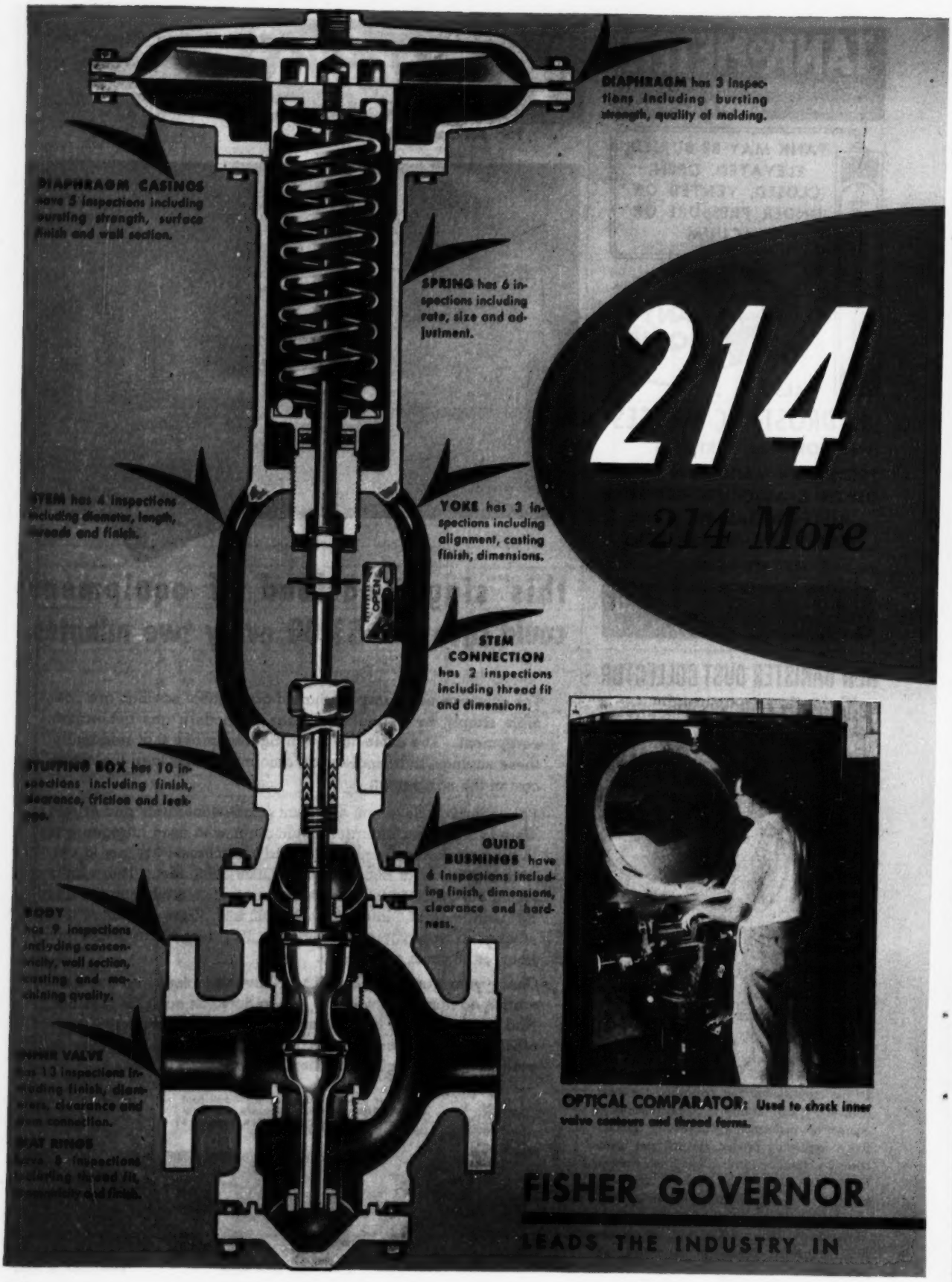
DIAPHRAGM has 3 inspections including bursting strength, quality of molding.
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214
214 More
STEM has 4 inspections including diameter, length, threads and finish.
YOKE has 3 inspections including alignment, casting finish, dimensions.
STEM CONNECTION has 2 inspections including thread fit and dimensions.
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GUIDE BUSHINGS have 6 inspections including finish, dimensions, clearance and hardness.
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VALVE has 13 inspections including finish, diameters, clearance and stem connection.
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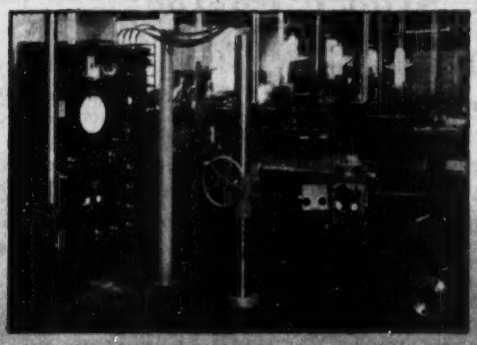
Here at Fisher we believe that *inspection makes perfect.* That's why *every* Fisher Automatic Controller is subjected to an *expert* and *comprehensive* inspection procedure. Typical of this rigid quality control program is the inspection schedule of the Fisher Type 57T diaphragm motor valve illustrated, with a few of the more prominent inspections indicated. From "start to finish", a total of *214 inspections* assures *long trouble-free service* in meeting the most exacting operating requirements. Yes, this Fisher *insistence on perfection* is another example of why Fisher Automatic Controllers always give you *more for your money!*



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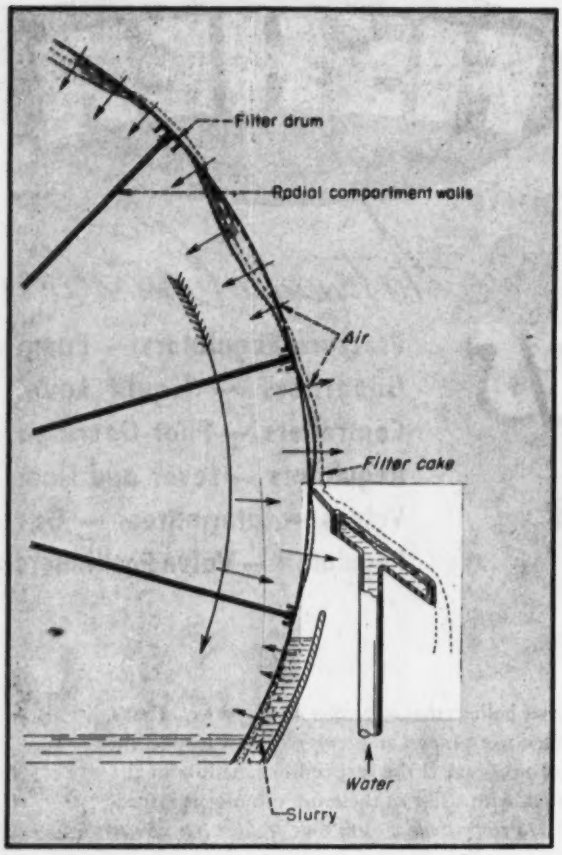

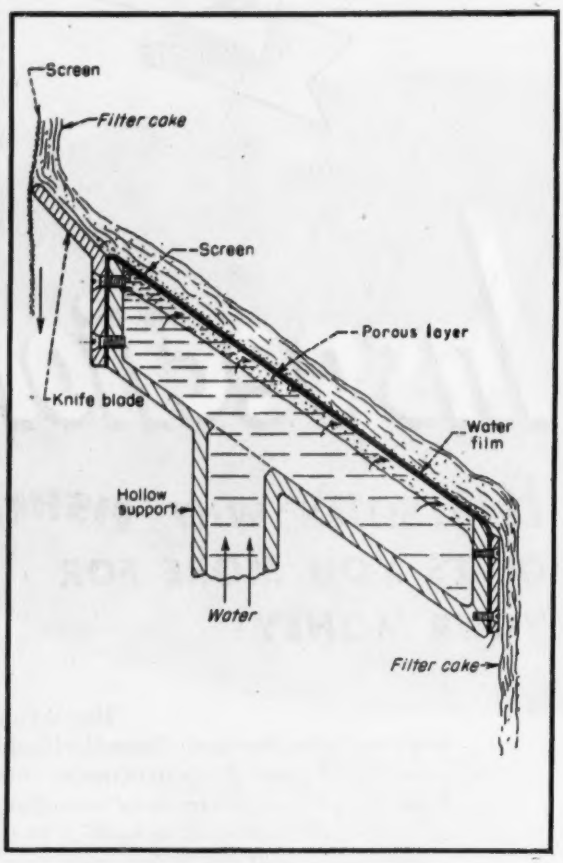

New Take-Off Knife Strips Sticky Pastes

A thin film of water passing over the take-off knife makes it easy to strip wet, sticky filter cakes from the drum of a continuous vacuum filter.

Here's a slick trick that belongs in the "why-didn't-I-think-of-that" department.

Cake removal from a vacuum rotary drum filter is easy when the cake is dry and relatively coherent. If any difficulty does arise, a blast of air under the cake is a quick, simple remedy.

However, if the cake is a wet, sticky paste, air-blasting before the take-off knife is useless. Cake will still adhere to the knife instead of passing smoothly over it and dropping off.

▶ **Ribs No Help**—Since a sticky cake has no mechanical strength, perforated ribs won't help either. Cake will adhere to the space between the ribs and clog them, making a smooth discharge impossible.

For this reason, continuous vacuum filters have not been suitable for the filtration of suspensions forming wet, sticky pastes. It has been necessary to use other types of filters, such as filter presses, which are more expensive to operate.

▶ **Hollow Knife Head**—To alleviate these difficulties, a special take-off knife has been designed. The new knife consists of a hollow head and a hollow support through which water, or some other liquid, flows. A screen extends around the head and is clamped to it at one end of the knife blade.

Before starting filtration, a small amount of the solids to be filtered is passed up through the knife head to form a thin porous cake on the underside of the screen.

Filtration is begun and the filter cake removed from the drum by the knife blade. An air blast on the underside of the filter cloth, just before it reaches the knife blade, bulges the cloth against the knife. This insures thorough removal of the cake.

▶ **Water Film the Key**—Cake slides along the take-off knife head on a microscopically thin water film. The film lubricates and supports the moving cake—even with the stickiest and

Meet the man you can call with confidence to solve your thermal insulation problems

To insulate outdoor tanks with complete weather protection, these skilled J-M applicators follow a specification developed by Johns-Manville. Here they are fastening J-M Asbestocite* Sheets over J-M Zerolite* Insulation. J-M 85% Magnesia Insulation is also widely used for this type of equipment

He is your J-M Insulation Contractor... the man with the world's most complete insulation engineering service

"Insulation is no better than the man who applies it." Today, with rising fuel and maintenance costs, it is especially important to place your insulation job in skilled hands. The scientific application of J-M quality insulations by J-M Insulation Contractors will assure you of the maximum return on your insulation investment for years to come. Moreover, you get undivided responsibility for *all* your insulation requirements.

1. You get dependable materials—Johns-Manville manufactures a complete line of insulations for every service temperature from minus 400F to plus 3000F. From them your J-M Insulation Contractor can select the right insulation for the most dependable service on your job. To develop new and improved insulation materials Johns-Manville maintains the J-M Research Center—largest laboratory of its kind in the world.

2. You get dependable engineering—For 95 years Johns-Manville has been accumulating insulation engineering experience. J-M Insulation Engineers are called upon to solve insulation problems of every type and magnitude, in every industry. Since your J-M Insulation Contractor works closely with J-M Insulation Engineers, he brings to *every* job a high degree of training, skill and experience.

3. You get dependable application—Johns-Manville has set up a nationwide organization of J-M Insulation Contractors to serve you. These Contractors maintain staffs of insulation engineers as well as skilled mechanics thoroughly trained in J-M's proved application methods. You can have absolute confidence in their ability to apply J-M insulations correctly for trouble-free performance.

For further information and the name of your J-M Insulation Contractor, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ont.

*Reg. U. S. Pat. Off.

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MATERIALS • ENGINEERING • APPLICATION

wettest material. Cake flows smoothly over the knife head and is discharged. The amount of water introduced into the cake by the thin film is said to be negligible.

Described in U. S. 2,652,929, the new head design has been assigned to the American Cyanamid Co. The inventors are Fridtjof Aagaard and Howard G. Weiss.

Improvement in Multiple-Effect Evaporation

Where the flow of liquor in a multiple-effect evaporator is countercurrent to the vapor, liquor transferred from one effect to another is below the boiling point for the pressure in the new effect.

To raise it to the proper temperature for boiling, it may be heated during transfer by vapor produced in excess of that required for balanced conditions. The method is described by Philip B. Sadtler in U. S. 2,651,356. He also describes a heat exchanger which may be used to effect the heat transfer.

Half of the patent has been assigned to H. M. Hunter, half to G. D. Dickey.

Work Recovered in Gas Absorption

In the conventional gas absorption operation, absorbing liquid is charged to the top of the column and a portion of the gas mixture is dissolved. This serves as "reflux" for the desired separation.

The operation as performed in this manner is thermodynamically irreversible, resulting in the loss of a substantial amount of work.

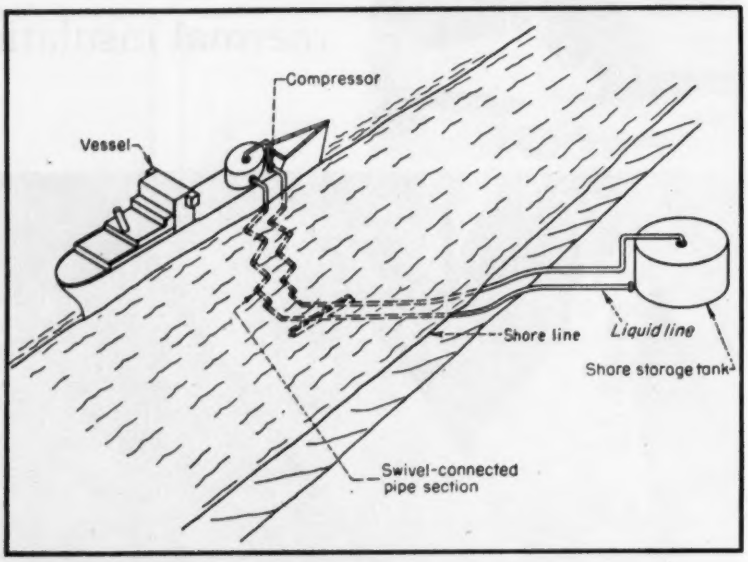
Much of this work can be recovered with a new technique developed by Manson Benedict.

Dr. Benedict takes the undissolved gas from the top of the fractionating zone and expands it to a lower pressure. Expansion takes place in an engine, thus recovering work.

After expansion, the gas is again contacted with the absorbing liquid. Undissolved gas is again expanded, more work recovered, and the gas again contacted with absorbent.

The lower pressure stages act as "saturating steps" for the absorbing liquid as it passes to the fractionation zone. Absorbing liquid is thus saturated in a manner which approaches reversibility, and work is recovered.

Dr. Benedict describes an apparatus to be used in conjunction with the technique, and he also gives several examples which illustrate the method. His patent, U. S. 2,652,129, was assigned to Hydrocarbon Research Inc.



Offshore Unloading of Liquefied Gases

Although unloading a ship via a submerged line and a flexible tube has been suggested before, previous proposals were not adaptable to the transfer of fluids under high pressure. A new technique has recently come to light which is particularly useful for the ship-to-shore transfer of such products as liquefied propane gas and other liquefied gases. Two lines are used in the new method, one for pumping the liquid, the other for returning vented vapor from the tank being filled to the tank being emptied.

► **Lines Underwater**—Two permanent submerged lines are extended outward from the shore any desired distance. These lines are generally of extra heavy pipe and are permanently anchored to the ocean floor by suitable ballast.

Swivel pipe sections connect the submerged lines to the vessel to be unloaded. Each of the swivel pipe sections consists of a number of comparatively short sections of straight piping connected by conventional high pressure swivel connections. The pipe sections differ in length throughout the flexible line to allow complete collapse of the flexible line without interference from the joints.

► **Much Freedom**—The swivel-connected flexible line permits a high degree of freedom for the vessel being unloaded. And, when not in use, folds accordion-like and nests on the ocean floor. Cables used for lowering the lines may also be used to anchor buoys to the spot. These not only mark the location of the lines but also facilitate raising them when needed.

Both the fixed lines and the flexible lines should be coated or subjected to cathodic protection to eliminate corrosion difficulties.

► **Liquid Transfer**—A pump may be placed in the liquid leg, but, since it is difficult to position it far enough below the liquid tank to supply the proper head, this is not desirable. It is better to place a compressor in the vapor leg. The compressor involves no positioning difficulties, and may be placed right on the deck of the ship in any convenient location.

The inventors, Frank G. Marancik and John A. Laudenberger, describe the invention and its use in U. S. 2,648,201. The patent has been assigned to Standard Oil Development Co.

You can obtain copies of any patents, including those mentioned here, by ordering from the Commissioner of Patents, Washington 25, D. C. They cost 25 cents.

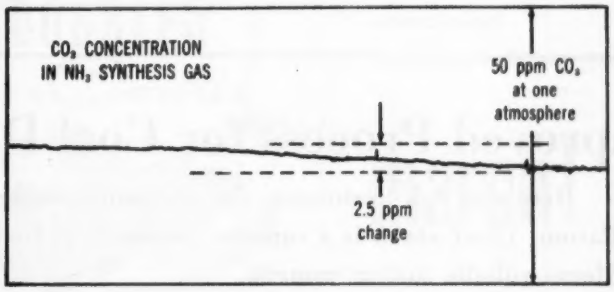
FACTS ON INFRARED FOR THE PROCESS PLANT

Looking for parts per million of impurity?

Then consider the use of Perkin-Elmer infrared plant stream analyzers. For example, the BICHROMATOR Analyzer is being used to measure water in "Freon" (fluorinated hydrocarbon) streams over a range from 0 to 10 parts per million! And a TRI-NON Analyzer can record continuously 0 to 50 parts per million of CO with 24-hour stability of ½ ppm!

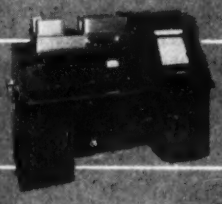
If the measurement of trace impurities in a process stream is your problem, Perkin-Elmer Infrared Analyzers may be the answer. Why not describe the problem to us? Our extensive application engineering laboratory can set up your problem for complete evaluation.

Perkin-Elmer infrared analyzers offer the best chance of solving your trace impurity problems. Because of their unique optical systems, Perkin-Elmer analyzers are far more sensitive and stable than other commercially available instruments. When delivered, all instruments are specifically sensitized and adjusted for your process stream.

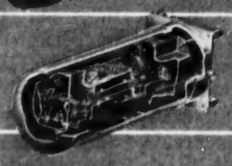


Typical portion of record from TRI-NON *Analyzer.*

THE ONLY COMPLETE RANGE OF INFRARED INSTRUMENTS TO MEET ALL REQUIREMENTS



FOR THE PILOT PLANT—*Model 14 Multi-Component Analyzer*— Continuously records the concentration of up to six components in a pilot process stream on a six-minute cycle. Ideal for tracking the effects of temperature, pressure, etc., changes in a pilot stream.



FOR THE PROCESS PLANT—*Model 93 BICHROMATOR* Analyzer* —For continuous control of liquid or gas streams. Records the ratio of any two wavelengths chosen. Thermostatted, enclosed in explosion-proof containers.

FOR THE PROCESS PLANT—*Model 105 TRI-NON* Analyzer* —Highly stable and sensitive. Suitable where there is considerable interference from stream components. Thermostatted, enclosed in explosion-proof containers.

*Trademark The Perkin-Elmer Corporation

Please send the bulletins checked

Model 14 ..... Models 93 and 105 .....

NAME .....

TITLE .....

COMPANY .....

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.....

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For Optical Design and Electro-Optical Instruments

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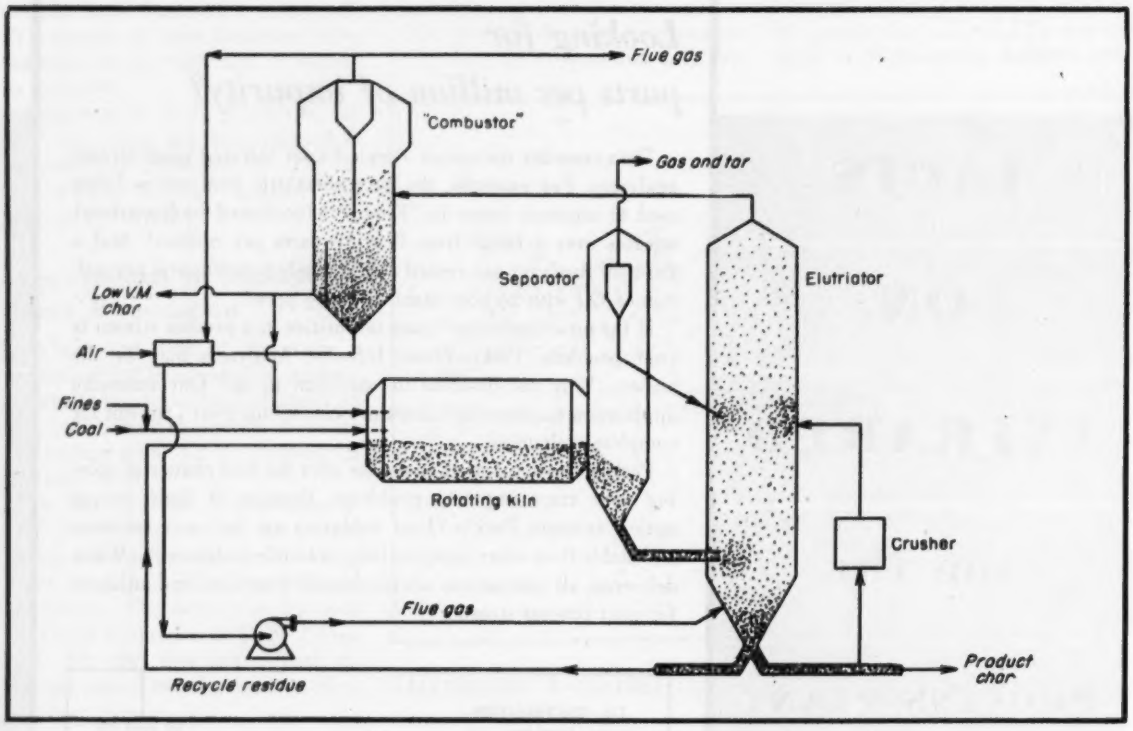


Improved Process for Coal Distillation

Here's a new technique for low-temperature coal distillation. Chief claim is a superior product—a fuel with a uniform volatile matter content.

Contacting finely-divided coal with the hot solid residue of a prior distillation in order to distill it at low temperatures is not new.

However, in present processes of this type the final solid product is a mixture of distillation residue, some of which was subjected to the average distillation temperature and some of which was subject to a much higher temperature. Thus, each fraction of the product has a different volatile matter content.

This is a definite drawback, since the most important industrial use of the solid product is as a power plant fuel, and, as such, a uniform, high-as-possible, volatile matter content is desired.

▶**The New Process**–A recently revealed process has been designed to overcome this difficulty and to yield a product with a uniform volatile matter content of 10 percent or higher.

Finely-divided coal of a predetermined particle size feeds into a rotating kiln along with preheated residue from a previous distillation. Average size of the residue particles is smaller than that of the fresh coal. This facilitates separation of the products by elutriation further on in the process.

▶**Distillation**–Rotating the kiln intimately mixes the coal and the hot residue, thereby increasing heat transfer. Temperature of the preheated residue is high enough to insure an average kiln temperature of 850 to 1,050 deg. F., the distillation temperature of the coal.

▶**Separation**–Distillation products–gas, tar and the mixture of solids–are discharged into a separator. Gas and tar pass out through a cyclone. Solids go on to the elutriator.

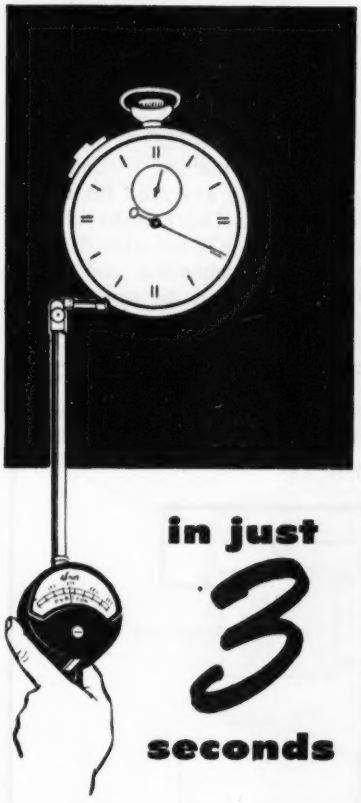
Elutriation gas is introduced at the bottom of this column. Its velocity is regulated to effect separation of the differently sized particles. Larger particles, essentially fresh distillation residue, are discharged from the bottom as product. Finer sized particles, preheated residue and any fresh residue which may have been reduced in size, are conveyed by the gas to a "combustor."

▶**Combustion**–Here the solids form a fluidized bed–made fluid by passing air through it. The air oxidizes the particles and raises them to the desired temperature. Hot distillation residue is discharged and readmitted to the kiln.

Flue gas is removed through a cyclone separator. Heat in this gas is used to preheat air going to the "combustor". Part of the gas may be used as the elutriation gas.

▶**Product**–A certain amount of depleted char is discharged from the system. This can be made-up by adding finely ground coal to the fresh charge. Another way is to crush part of the product char small enough to be carried with the elutriation gas.

▶**No Equipment Details**–Details of



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the rotating kiln and of its method of operation are not described in this patent. These are, however, disclosed in a pending patent application. The patent does state that agglomeration is prevented by the dilution effect of the recycled char.

The new method was described in U. S. 2,654,698 by the inventor, John A. Phinney. He has assigned his patent to Pittsburgh Consolidated Coal Co.

Sulfonic Acid From Sulfuric Acid Sludge

Here's a way to extract detergent-type and oil soluble sulfonic acid from the sulfuric acid sludge produced when hydrocarbons are treated with strong H_2SO_4.

A solvent consisting of an aliphatic alcohol, such as isopropanol, and an aromatic hydrocarbon, such as benzol or coal tar "solvent naphtha," is used for the extraction. Aliphatic alcohol content of the solvent should run between 5 and 10 percent.

Naturally, the sulfuric acid concentration in the sludge should be low enough so as not to cause sulfonation of the aromatics in the solvent, i.e. it should be less than 90 percent. If it is not, 80 percent acid can be added to the sludge to dilute it.

The inventors, N. E. Lemmon, F. W. Schnessler and D. W. Bransky, have assigned the patent, U. S. 2,654,777, to Standard Oil Co. (Ind.).

Fine Graphite for High Quality Electrodes

Very fine synthetic graphite, suitable for use in electrodes and other high-quality graphite elements, can be produced by either of two processes described by Daniel Gardner in U. S. 2,653,082.

In the first process, carbon monoxide is passed through a spark gap and decomposed into carbon and oxygen. Voltage across the spark gap is about 100,000 v. and the current frequency is 500 kc.

Carbon from the spark gap is tetravelent, as in a diamond, but in the form of very fine particles. These particles are collected under an inert (nitrogen) atmosphere and converted to trivalent graphite.

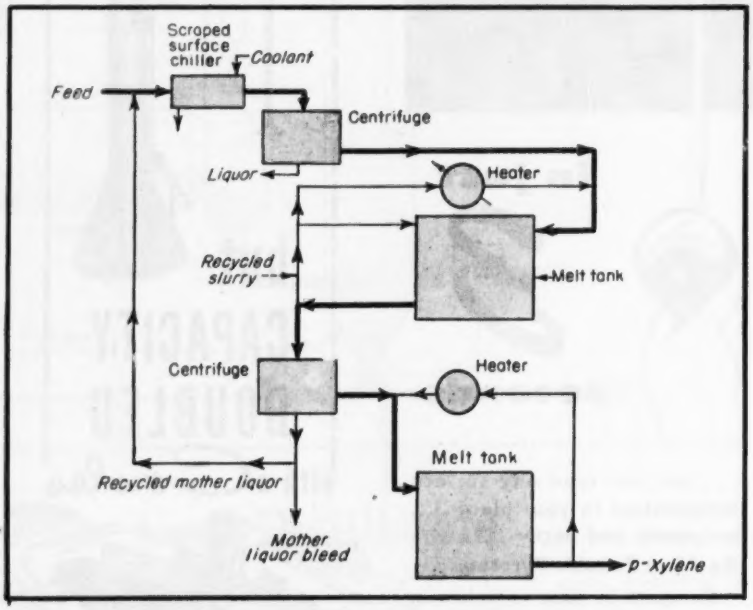
To convert from the tetravalent to the trivalent form, the carbon particles are heated to between 575 and 760 deg. F. Powdered dry calcium carbide is added to provide satisfactory heat transfer to the carbon particles, and the mixture placed in a bath of molten anthracite.

After heating, the mixture is filtered and the graphite dissolved in cyclooctane. Graphite is finally recovered by stripping off the cyclooctane solvent.

In Gardner's other process, dried powdered calcium carbide is mixed with anhydrous sulfuric acid at a temperature below 525 deg. F. Carbon monoxide is then passed through the mixture and a reaction occurs:

$$CaC_2 + CO + H_2SO_4 \longrightarrow CaSO_4 + 3C + H_2O + 173.3 \text{ Cal.}$$

When the reaction is completed, water is boiled away and the $CaSO_4$ decanted off. The particles of very fine graphite left are washed to remove trace impurities and dried. These particles are the same as those produced by the first method.



p-Xylene Recovered by Crystallization

The big feature of this new method of recovering p-xylene is a product purity of 90 percent.

As any who have worked with the isomers of xylene know, separating them can be a miserable job. And obtaining one isomer in anything resembling the pure state is both difficult and expensive.

▶**How It's Done**—Feed for the new process flows through a scraped surface heat exchanger and its temperature is dropped to between −90 and −110 deg. F. Crystals formed here are carried by the mother liquor to the first centifruge.

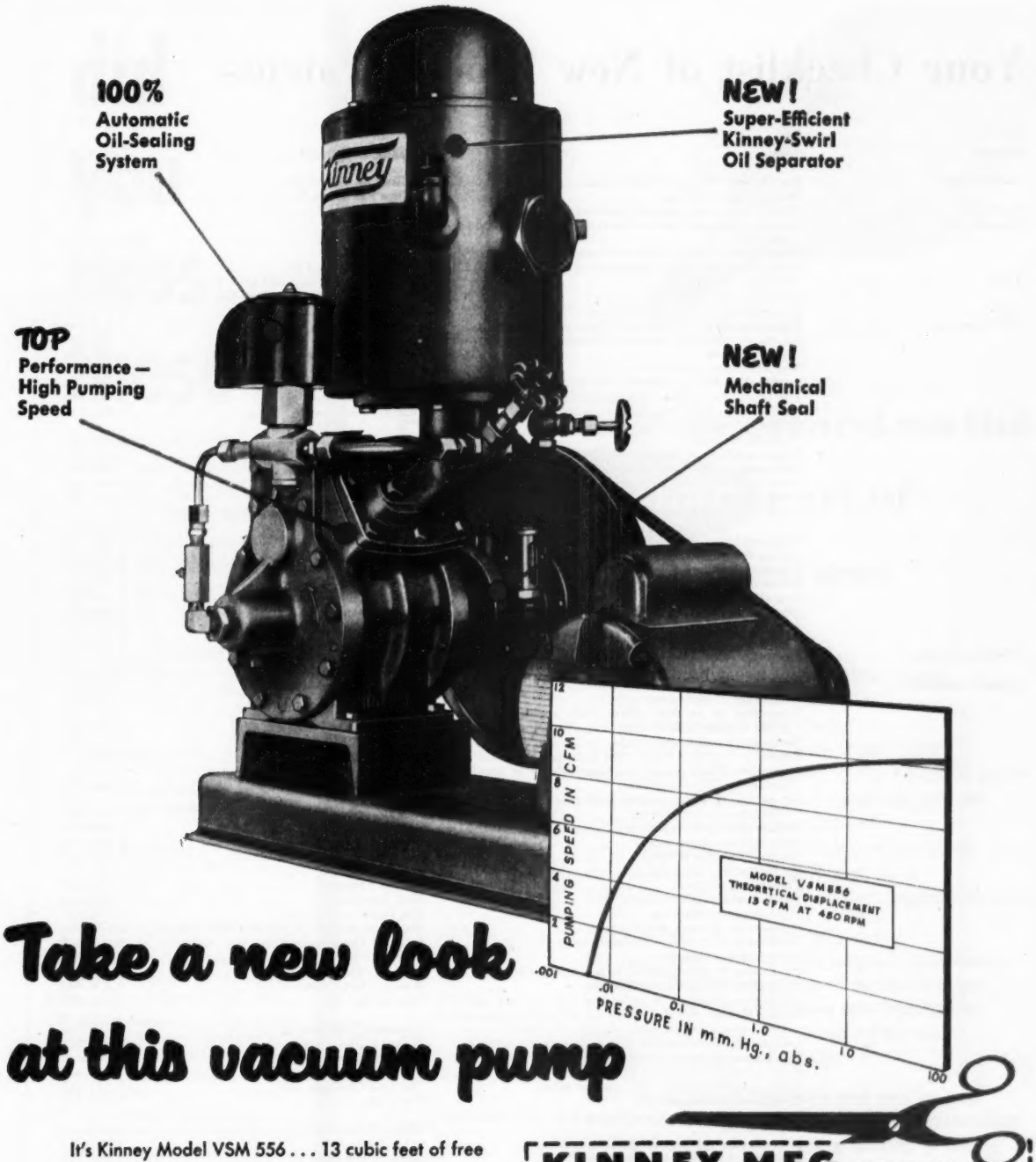
The centrifuge subjects the slurry to a force of about 750 times gravity. Mother liquor is discharged for further handling, while the cake, substantially p-xylene crystals, passes on to the melt tank.

In the melt tank, the crystals are partially melted to provide a slurry containing p-xylene crystals (from 30 to 85 percent by weight). Part of this slurry is recycled through an external heater, the remainder goes on to another centrifuge. This one at about −30 to −40 deg. F.

Liquor recovered from this centrifuge is recycled to the scraped surface chiller and put through the process again. Cake goes on to a second melt tank, operated at about 55 deg. F. Here the p-xylene crystals are melted and removed—approximately 90 percent pure.

▶**Temperature Control**—Lowering the temperature to just above the eutectic point of p-xylene and the next most easily precipitated component is the secret of the new method. Accurate temperature control is vital to prevent coprecipitation of impurities.

The inventor, John D. Booker, has assigned his patent, U. S. 2,651,665, to Standard Oil Development Co.



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Your Checklist of New Process Patents

Product . .	Process . .	Inventor or Assignee . . .	Patent No.
Carbon black	Manufacture of furnace carbon black	Godfrey L. Cabot, Inc	2,652,313
	Carbon black pelleting	Phillips Petroleum Co	2,652,344
Catalysts	Forming spheroidal catalyst particles	Sinclair Refining Co	2,652,371
Fats and oils	Preparing saturated fatty acids of improved color and color stability	General Mills, Inc	2,652,414
	Refining and purifying fats and higher fatty acids	Ilona Taussky	2,654,766
	Production of fatty acid concentrates	The M. W. Kellogg Co	2,654,768
Fuels	Water gas generation	Standard Oil Development Co	2,652,319
	Gasification of solid fuels	Pittsburgh Consolidation Coal Co	2,654,661–5
Gases	Cold separation of gaseous mixtures	l'Aire Liquide	2,653,455
Hydrocarbons	Separating polycyclic aromatics from organic mixtures	The Texas Co	2,652,435–6
	Solvent extraction of mixtures of saturated and unsaturated hydrocarbons	Phillips Petroleum Co	2,652,439
	Aromatics from petroleum	Sun Oil Co	2,653,175
	Naphthalene from petroleum cycle stocks	Sinclair Refining Co	2,653,176
	Alkylation of aromatics with isoparaffins	Phillips Petroleum Co	2,653,980
	Furfural extraction of aromatics from a gas oil	Phillips Petroleum Co	2,654,792
Inorganic chemicals	Method of adjusting the concentration of ammonium nitrate solutions	Phillips Petroleum Co	2,650,660
	Preparing titanium tetrachloride	National Lead Co	2,650,873
	Producing pure barium and strontium hydroxides	Delia J. Rentschler	2,651,563
	Froth flotation of sylvinite ores	Potash Co. of America	2,652,150
	Production and recovery of ammonium sulfate	Phillips Petroleum Co	2,653,077
	Preparation of chlorine dioxide	Deutsche Gold- und Silber-Scheideanstalt vormals Roessler	2,653,079
	Preparing ferric oxide compositions of polishing rouge grade	C. K. Williams & Co	2,653,080–1
	Drying ammonium nitrate	Phillips Petroleum Co	2,653,391
	Preparing beryllium fluoride	Govt. of Great Britain	2,653,856
	Preparing calcium fluoride	General Electric Co	2,653,857
	Precipitation of aluminum hydroxide	Aluminum Co. of America	2,653,858
	Classification of phosphate ore	International Minerals & Chemical Corp	2,654,477
	Uranium tetrafluoride production	Imperial Chemical Industries Ltd	2,654,654
	Production of chlorine dioxide	Addage Ltd	2,645,656
Metals and ores	Electroplating of nickel	The Udylite Corp	2,654,703–4
	Electroplating of nickel	Hanson-Van Winkle Mining Co	2,654,705
Organic chemicals	Production of carboxylic acid amides	W. Rappe and A. Magin	2,648,685
	Preparation of cholesterol	Armour & Co	2,648,687
	Production of ethereal esters from aliphatic aldehyde esters and aliphatic alcohols	Standard Oil Development Co	2,648,692
	Synthesizing organic carbonates	Ohio-Apex, Inc	2,648,697
	Recovery of alcohols from direct hydration of olefins	Standard Oil Development Co	2,648,711
	Separation of acetone and propionaldehyde by azeotropic distillation with methanol	Gulf Research & Development Co	2,649,406
	Separation of ethyl acetate and ethanol by azeotropic distillation with methanol	Gulf Research & Development Co	2,649,407
	Preparation of amino ketones	Burroughs Wellcome & Co., Inc	2,649,444
	Preparation of olefin oxides	The M. W. Kellogg Co	2,649,463
	Preparing organic sulfates	Eastman Kodak Co	2,649,469
	Production of maleic acid	The Distillers Co. Ltd	2,649,477
	Preparation of furans	Phillips Petroleum Co	2,650,236
	Production of higher ketones	Shell Development Co	2,650,253
	Manufacture of epoxides	The Distillers Co. Ltd	2,650,927
	Preparation of esters of silicic acid	Montclair Research Corp. and Ellis-Foster Co.	2,650,934
	Preparation of hydroxy-carboxylic acids	Schenley Laboratories, Inc	2,650,936
	Manufacture of glycols	The Distillers Co. Ltd	2,650,940
	Conversion of carbohydrates to polyhydric alcohols	Shell Development Co	2,650,941
	Production of hexachloropentadiene	Hooker Electrochemical Co	2,650,942
	Extractive distillation of acetic acid from aqueous solutions	Courtaulds Ltd	2,651,604–5
	Soluble calcium salt of a copolymer of vinyl acetate and a mono-ester of maleic acid	Monsanto Chemical Co	2,652,380
	Suspension polymerisation of unsaturated organic cpds	Walter P. Hohenstein	2,652,392
	Preparation of anthraquinone cpds	American Cyanamid Co	2,652,408
	Preparation of sulfonation products	Allied Chemical & Dye Corp	2,652,427
	Manufacture of chloromethyl methyl ether	The Dow Chemical Co	2,652,432
	Separation of acenaphthene	The Texas Co	2,652,438
	Thiourea separation of naphthenes from their oxygenated derivatives	Phillips Petroleum Co	2,653,147
	Manufacture of tetraethyl lead	Ethyl Corp	2,653,159
	Synthesis of alkylene cyanohydrins	Rohm & Haas Co	2,653,162
	Production of monoesters of phthalic acids	California Research Corp	2,653,165
	Fumaryl chloride preparation	Allied Chemical & Dye Corp	2,653,168
	Purification of chlorocyclohexanes	C. H. Boehlringer Sohn	2,653,174
	Refining chlorinated benzene	Allied Chemical & Dye Corp	2,653,904
	Ethylene oxide manufacture	Chempatents, Inc	2,653,952
	Controlled oxidation of aliphatic hydrocarbons to oxygenated organic cpds	Celanese Corp. of America	2,653,962
	Catalytic addition of cyanogen halides to olefins	American Cyanamid Co	2,653,963
	Preparation of nitriles	Eastman Kodak Co	2,653,964
	Anthranilic acid manufacture	Maumee Development Co	2,653,971
	Process for methyl group shifting on an olefin	Phillips Petroleum Co	2,653,981
	Catalytic alkylation of isoparaffins with olefins	Sun Oil Co	2,653,982
	Nitration of organic compounds	The M. W. Kellogg Co	2,654,658–788
	Process of alcoholysis	The Sherwin-Williams Co	2,654,767
	Organosilicon cpds. via the Grignard reaction	Mo Och Domsjo Aktiebolag	2,654,771
	Manufacture of DDT	Leo P. Curtin	2,654,790
Resins	Epoxide resins heated with vegetable oils in the presence of steam	Jacobus Rinse	2,652,376
	Producing solutions of formaldehyde-urea reaction products	Allied Chemical & Dye Corp	2,652,377
	Preparation of polyester resin compositions	American Cyanamid Co	2,652,382–3
	Continuous preparation of beaded phenol sulfonic acid-formaldehyde condensation product	American Cyanamid Co	2,652,386

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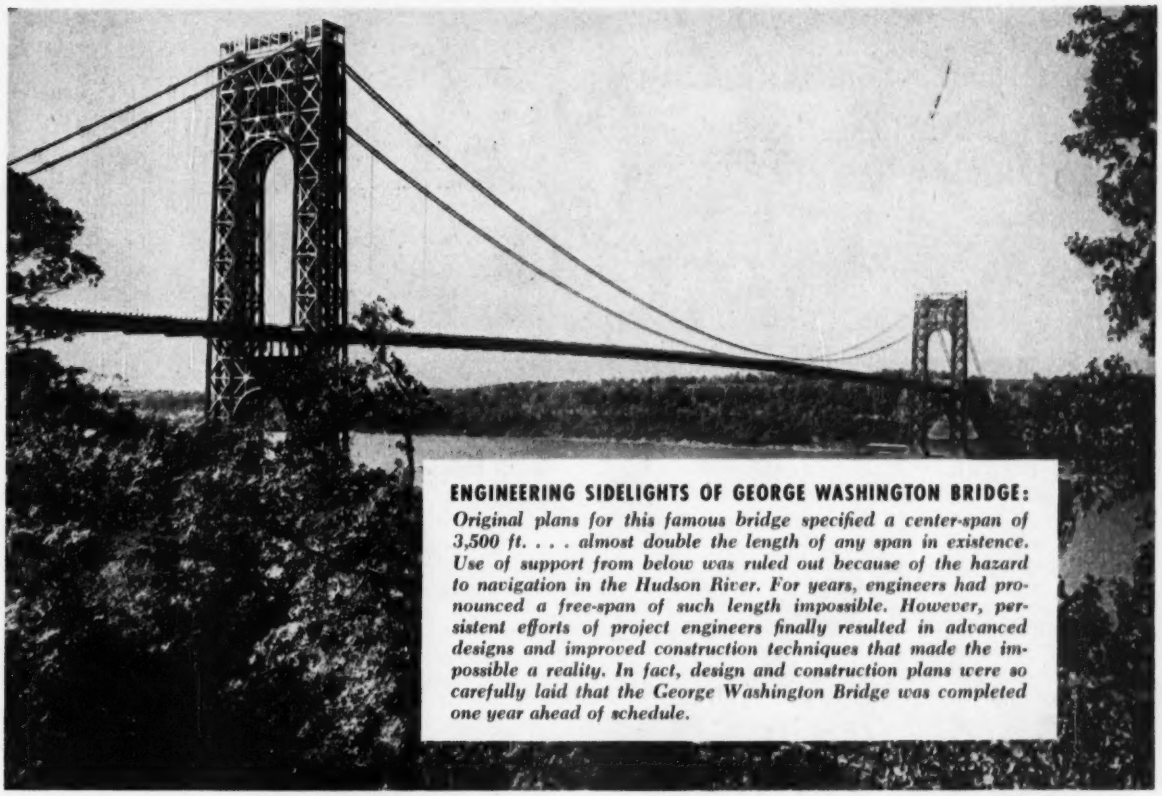
McGRAW-HILL PUBLICATIONS

New Process Patents (continued)

	Polymerization with alkyl phosphite catalysts	Eastman Kodak Co	2,652,393
	In-place expanded cellular resinous bodies from phenol and aldehyde resins with the aid of a peroxide	Westinghouse Electric Corp	2,653,139
Rubber	Producing rubber-like copolymers in particle form	The Whitney Blake Co	2,653,145
	Reclaiming rubber	U. S. Rubber Reclaiming Co., Inc	2,653,914–6
	Making light-colored rubber hydrochlorides	Farbwerke Hoechst Aktiengesellschaft vormals Meister Lucius und Bruning	2,654,793
Soap	Continuous soap purification	Union Francaise Commerciale et Industrielle	2,653,958
Synthesis processes	Catalytic hydrogenation of CO to orientable hydrocargon polymers	E. I. du Pont de Nemours & Co	2,652,372
	Recovery of organic oxygenated compounds	Stanolind Oil & Gas Co	2,652,415
	Recovering oxygenated organic cpds	The Texas Co	2,653,959
	Process for treating synthesis products	The Texas Co	2,653,960
	Recovering oxygen cpds. from Fischer-Tropsch product	Phillips Petroleum Co	2,653,965*
Synthetic fibers	Production of viscose	American Viscose Corp	2,648,661
	Continuous nitration of cellulose	Olin Industries, Inc	2,649,441
	Production of polyethylene terephthalate	E. I. du Pont de Nemours & Co	2,650,213
	Acrylonitrile production	Mathieson Chemical Corp	2,653,913–6
	Polymerization control of acrylonitrile	E. I. du Pont de Nemours & Co	2,654,761
Waxes	Continuous process for separating waxlike constituents from oil	The Texas Co	2,653,122–3

. . . And New Equipment Patents

Operation . . .	About . . .	Inventor or Assignee . . .	Patent No.
Adsorption	Adsorption-stripping separation	Phillips Petroleum Co	2,652,437
Chemical reaction	Reactor for catalytic conversion of hydrocarbons	Standard Oil Development Co	2,652,317
	Pyrolysis furnace	Hercules Powder Co	2,653,859
Crushing and grinding	Pulverizer and mixer	Arthur L. Hall	2,652,983
	Jaw crusher with opposed jaws driven by unbalanced weights	Gerhard Linke	2,652,985
	Rotary weight-impact crushing mill	Newton L. Hall	2,653,769
Distillation	Bubble tray water decanter	Humes B. Manley	2,652,238
	Distillation tray structure	Standard Oil Development Co	2,652,239
	Fastening device for bubble cap assemblies	Gilbert & Barker Manufacturing Co	2,653,018
	Apparatus for distilling metals	Compagnie des Freins & Signaux Westinghouse	2,654,700
Drying	Rotary drier or kiln	Gustav Bojner	2,653,393
Extraction	Liquid-liquid contacting apparatus	Standard Oil Development Co	2,652,316
	Cleaner for centrifugal countercurrent extractors	Walter J. and Wladzia G. Podbelniak	2,652,975
	Apparatus for extraction of beet chips	Pfeifer und Langen	2,653,114
Filtration	Method for precoating a filter medium	Charles A. Frankenhoff	2,652,152
	Filter medium for rotary drum filters	Thomas R. Komline	2,652,927
	Rotary drum filter	Thomas R. Komline	2,652,928
	Restoring filtering characteristics of filter cloth	Kaiser Aluminum & Chemical Corp	2,653,716
	Thermoplastic resin-impregnated paper filter element	Fram Corp	2,654,440
Fluid and particle	Method of discharging solids and gases from a fluidized bed	Pittsburgh Consolidation Coal Co	2,654,699
	Elevation of granular solids	Sun Oil Co	2,653,958
Heat transfer	Fused silica heat exchanger	E. I. du Pont de Nemours & Co	2,652,037
	Kiln	Asbe Corp	2,653,809
	Burner for kilns	F. L. Smidth & Co	2,653,810
	Gas cooling contact apparatus	Research Corp	2,654,584
Instrumentation and control	Device for measuring liquid level	U. S. Atomic Energy Commission	2,651,940
	Linear response vapor pressure thermometer	Foxboro Company	2,651,941
	Continuous weighing mechanism for solids	Phillips Petroleum Co	2,652,141
	Plug valve for flow control of solids-laden liquid	Nelson L. David	2,652,175
	Thermal flowmeter	Phillips Petroleum Co	2,652,721
	Measurement of water vapor in gases	Shell Development Co	2,654,242
	Apparatus for measuring surface tension	American Cyanamid Co	2,654,243
	Apparatus to control gas flow	American Cyanamid Co	2,654,387
Mixing	Dispersion mill	The Tri-Homo Corp	2,654,541
	Dispersing a substance in a liquid	Stamicarbon N. V	2,653,801
Molding and extrusion	Extrusion apparatus to reclaim rubber	U. S. Rubber Reclaiming Corp	2,653,348–9
	Pelletizer for plastic materials	Celanese Corp. of America	2,653,350
	Device for advancing and working elastomer cpds	Western Electric Co., Inc	2,653,351
	Apparatus for drawing vitreous tubes and rods	General Electric Co	2,653,418
	Glass fiber drawing device	International Harvester Co	2,654,182–3
	Glass feeding apparatus	Embart Manufacturing Co	2,654,184
	Feeder spout for molten glass	Embart Manufacturing Co	2,654,185
Safety devices	Flare stack lighter	Standard Oil Development Co	2,648,376
Screening	Vibrating screen	G. Overstrom, C. Overstrom and G. A. Overstrom	2,651,419
Solid-gas separation	Gas cleaning apparatus	George E. Lynch	2,653,675
	Electrical precipitator	Research Corp	2,654,438
Solid-liquid separation	Separation of solids suspended in liquids	De Directie van de Staatsmijnen	2,654,479
	Centrifugal separator	Dean H. Davis	2,654,535
Solid-solid separation	Froth flotation apparatus	Rudolph Wunsch	2,652,924
	Hydraulic jig	The Jeffrey Manufacturing Co	2,653,715
Storage	Floating roof	Chicago Bridge & Iron Co	2,648,457
	Seal hanger for floating roof tanks	Chicago Bridge & Iron Co	2,649,985
	Apparatus for shipping and storing cold liquefied combustible gases	Union Stock Yards & Transit Co	2,650,478
	Seal mechanism for a floating roof tank	Graver Tank & Manufacturing Co	2,650,738
	Floating roof tank	American Pipe & Steel Corp	2,651,433
	Liquid sealing device for tank vents	Keith M. Adair	2,651,434
	Storage and vaporizing apparatus for LPG mixtures	John W. Du Rant	2,651,921
	Tank gauging apparatus	Standard Oil Development Co	2,651,938
	Device to measure the contents of large tanks	Comstock & Westcott, Inc	2,651,939



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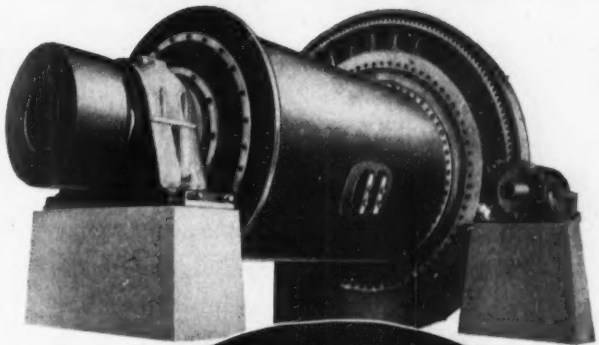

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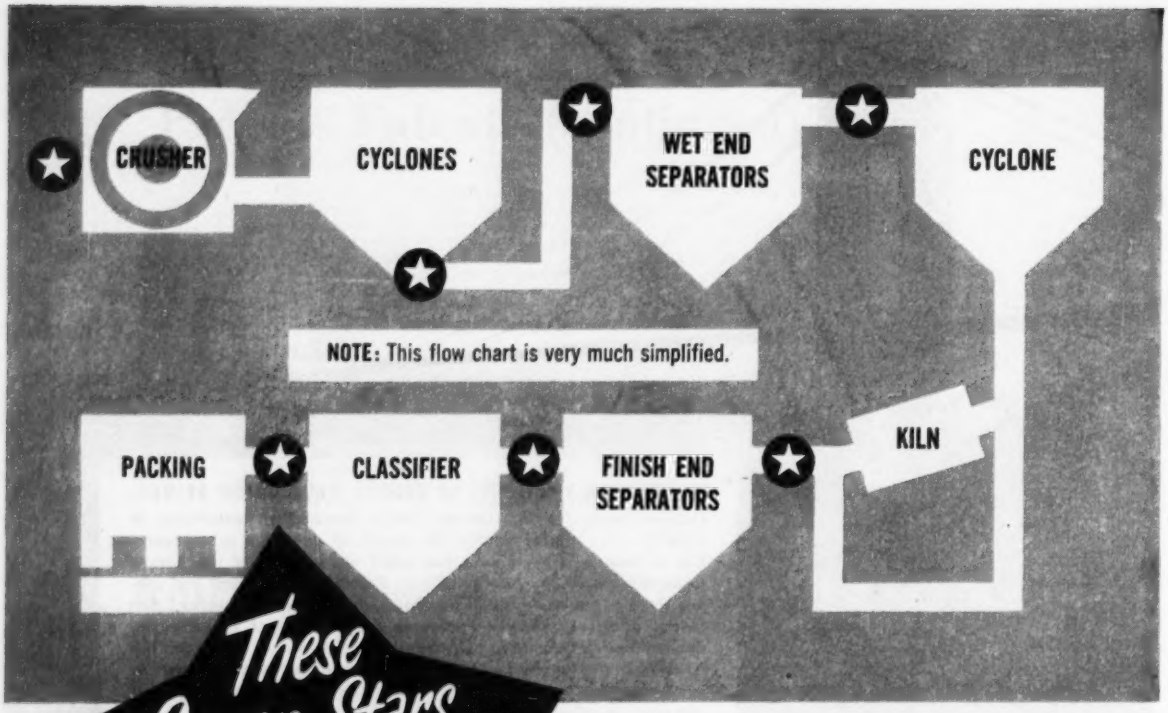

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To you, this means even higher quality Dicalite – assurance that every sack of every Dicalite product will be uniform in particle size, particle range and distribution, and in other physical and chemical properties. Whether your processing involves filtration, filler materials, extenders, diluents, carriers, or absorbents, DICALITE's unvarying top quality gives you better processing, better products.

---

*If you'd like to see the more detailed flow sheet of DICALITE's new Lompoc plant, and learn more about how top quality in diatomite products is achieved, write today for your free reprint of the feature article in the February issue of Industrial & Engineering Chemistry. Write Great Lakes Carbon Corporation, Dept. F3-51-612 So. Flower Street, Los Angeles 17.

Dependable GREAT LAKES Dicalite® DIATOMACEOUS MATERIALS

DICALITE DIVISION • GREAT LAKES CARBON CORPORATION • NEW YORK 17 • CHICAGO 1 • LOS ANGELES 17

MEMO TO COST-CONSCIOUS PUMP BUYERS:

The centrifugal pump to handle your job to satisfaction and at lowest power and upkeep cost is shown or described on this page.

"Buffalo"

Pumps are not built to sell cheaply, but to operate cheaply. That is where pump savings are made. May we suggest that you and your staff write us for engineering bulletins on any pumps you need. Then look into the long-life features like oversize "Buffalo" bearings, shafts and stuffing boxes. See the accessibility of all parts, the high efficiency impeller design. You'll see why "Buffalo" Pumps save money!

BUFFALO PUMPS, INC.
BUFFALO, NEW YORK

Subsidiary of Buffalo Forge Co. Canada Pumps, Ltd., Kitchener, Ont.

...and DID YOU KNOW that you can get a "Buffalo" Fan of the exact size and type you want — for ventilation, blowing, exhausting, draft, air conditioning supply. "Buffalo" has been First For Fans for 75 years. You're safe in specifying "Buffalo" for your air handling needs!

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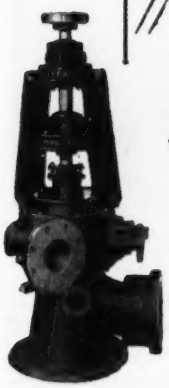
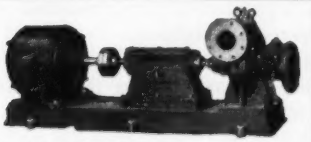
501 BROADWAY BUFFALO, N.Y.
Publishers of "Fan Engineering" Handbook
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

"Buffalo" PUMPS

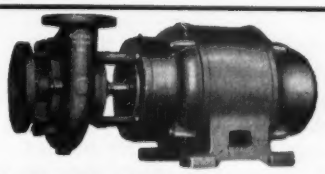


NON-CLOGGING SEWAGE PUMPS
For trouble-free sludge circulation, agitation and removal. Vertical or horizontal models. Request Bulletin 964-G.

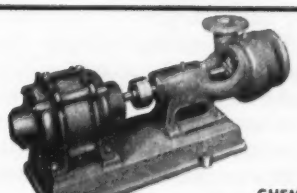
SUMP PUMPS
Complete units ready to install. No stuffing boxes required. Ball bearing thrust and enclosed shaft. Bulletin 963-F.



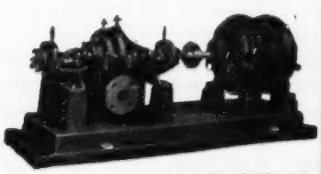
PAPER STOCK PUMPS
A pump for every liquid, consistency and head. Non-clogging enclosed impellers retain initial efficiency. Mill-proven for many years. Bulletin 953.



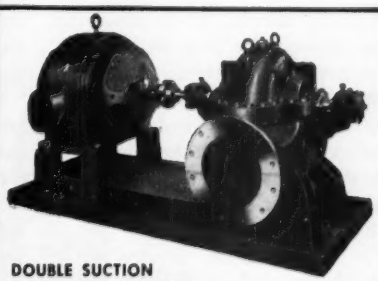
CLOSE-COUPLED PUMPS FOR ALLOY CONSTRUCTION
Compact, sturdy, easily installed. Shafts in permanent alignment. Bulletin 975.



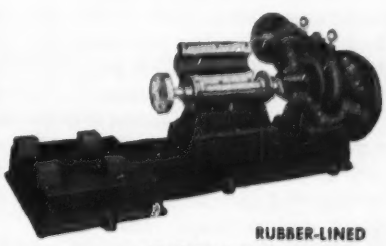
CHEMICAL SERVICE PUMPS
Suitable for construction in most machineable alloys. Full ball bearing, single suction. Bulletin 982.



MULTISTAGE CLEAR WATER PUMPS
for pressures up to 500 psi. Rugged, efficient, popular boiler feed pumps. Bulletin 980. "Buffalo" also manufactures automatic condensate pump and receiver units.

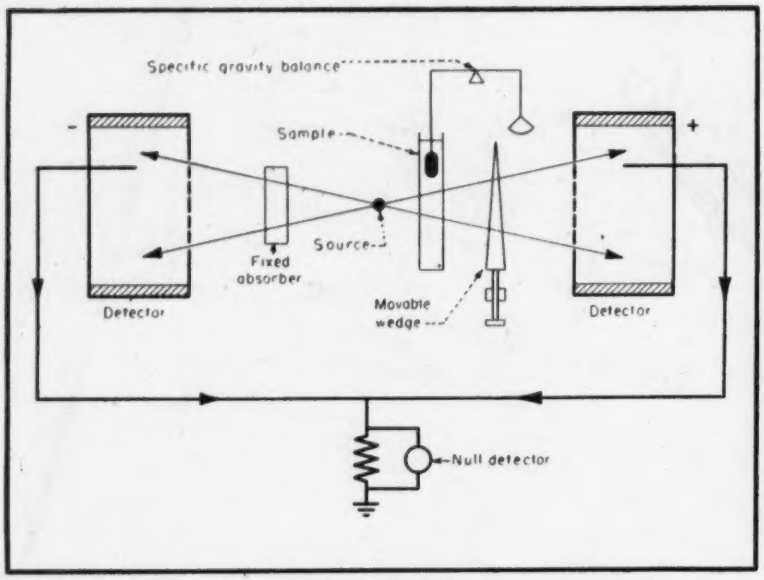


DOUBLE SUCTION CLEAR WATER PUMPS
are hydraulically balanced and of finest obtainable construction. Bulletin 955.

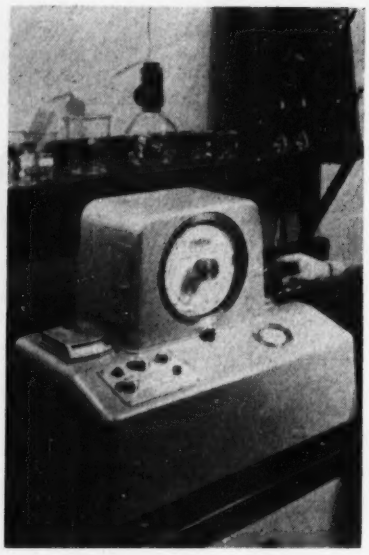


RUBBER-LINED
"Buffalo" Rubber-Lined Pumps handle a wide variety of acids, caustics and liquids containing abrasives. All pump parts contacting liquid are covered with the proper grade of rubber. Bulletin 953.

NEW INSTRUMENTS & CONTROLS



BETA RAY source radiates equally in two directions to produce null balance.



COMPACT unit is fully shielded.

Beta Rays Slash H_2 Test Time

Percentage hydrogen and H/C ratio in liquid hydrocarbons are determined in minutes rather than hours. Method provides new production control tool for many processes.

Latest addition to the list of peacetime uses of byproducts from the atomic energy program is a new instrument for determining hydrogen. Beta rays coming from the radioactive decay of strontium 90 have slashed the time for this basic product control test from four hours to five minutes. At the same time accuracy has been increased more than 100 percent.

Until recently determination of hydrogen was too difficult and time-consuming to be used as a practical production control tool. With the Beta Ray H/C meter percentage hydrogen and H/C ratio in liquid hydrocarbons are easily determined.

Performance of pilot model beta ray meters indicates a statistical probable error of 0.02 weight percent hydrogen on individual determinations. Previous combustion technique tests usually have resulted in statistical probable errors up to 0.05 weight percent hydrogen. Corrections can be made to take into consideration the presence of oxygen, hydrogen, sulphur, lead and other elements.

Immediate applications of the meter are predominantly in the petroleum and petrochemical industries. However, it appears likely that the instrument can be used to effect product control in processing of pharmaceuticals, chemicals, plastics, foods and in hydrogenation processes.

You can see how the instrument operates by referring to the schematic sketch above. The beta ray source is constructed to radiate in two directions. On the left the beam traverses a fixed absorber and proceeds to a beta ray detector. This detector consists of an ionization chamber designed to collect negative electric charge on the central electrode.

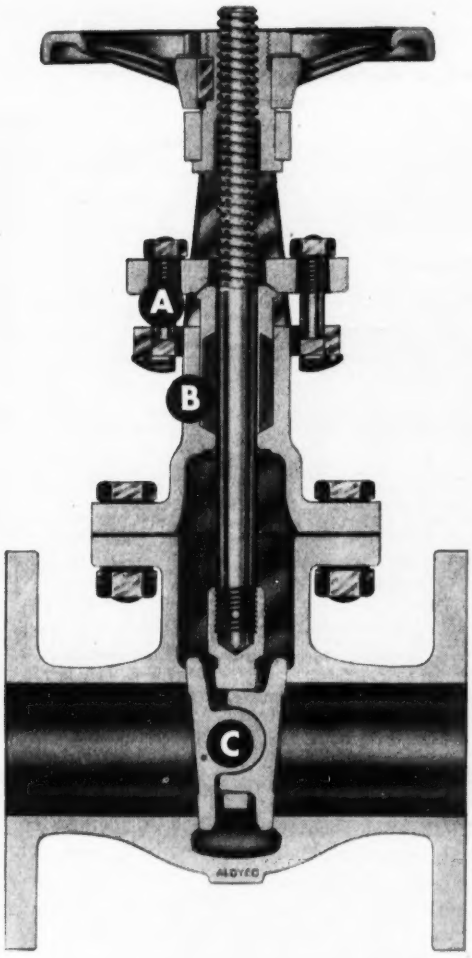
The equal beta ray radiated to the right traverses a sample cell and a wedge shaped absorber before entering the other beta ray detector. A galvanometer indicates the difference in magnitude of electric current produced in the two ionization chambers. Provision is made for simultaneous determination of sample density.

To obtain a determination the 10 cc. capacity sample cell is filled with hydrocarbon of unknown hydrogen content. The wedge shaped absorber then is moved until the galvanometer indicates equal currents are produced in the two ion chambers.

At this point the absorption of the sample in the cell plus that of the wedge equals the absorption of the fixed absorber. Position of the wedge is recorded and used as a measure of absorption in the wedge. Difference between absorption of the wedge and the fixed absorber is the amount of absorption by the sample. This is a direct indication of the hydrogen content of the sample.

Safeguards incorporated in the instrument fully protect the operator from radiation hazards. The radiation source is a sealed capsule contained in a fixed copper block. Additional shielding is built into the walls of the ionization chamber. Still further protection is provided by the thick walls of the meter housing.

This combination of shielding is so



This Aloyco 20 valve cuts maintenance costs in corrosive service

• Prevent valve corrosion from eating into your production and profits!

How? Look to Aloyco, the world's largest specialists in the manufacture of corrosion-resistant valves, for the valve design and alloy that will give lasting, maintenance-free performance.

Mechanically, this Aloyco Gate Valve 111-A is evidence of the careful attention given every detail of construction that marks Aloyco's complete line. To determine the best materials for each specific application, our engineers will be glad to pre-test various alloys under your actual line conditions and base their recommendations on actual service data.

If you have a problem of valve maintenance or replacement because of corrosion, write to Aloyco's Corrosion Engineering Service about your own valve needs. Or call your nearest Aloyco distributor.

ALOYCO 111-A GATE VALVE

***Advanced features* of these valves increase their corrosion-resistance**

- Double disk ball-and-socket type wedges are free to rotate and are non-fouling in any position to assure pressure tightness on both seats.
- Stuffing boxes may be repacked with Teflon or conventional packing material even when valve is under pressure and wide open.
- Rocker type gland plates and guided gland followers prevent marring of the stems when repacking.
- Handwheels keyed to yoke-bushings for easy disassembly.
- All parts are of corrosion-resistant alloy except yoke-bushings, nuts and handwheels. Available from ½" to 12". Alloys regularly stocked are Aloyco 20, 18-8S and 18-8SMo.

A. Rocker type gland plates and guided gland followers.
B. Teflon packing for stuffing box (optional).
C. Double disk, ball-and-socket type wedges.

ALOYCO 20

This alloy was specifically developed to provide corrosion-resistance against a wide range of sulphuric acid concentrations and temperatures.

Since its inception, Aloyco 20 has also proved highly effective in handling varied concentrations of sludge acid, caustic soda, fatty acids, acetic acid, phosphoric acid, chlorinated hydrocarbons, and many other process solutions.

Longer Lasting
ALOYCO VALVES
1st in Corrosive Service

ALLOY STEEL PRODUCTS COMPANY, Inc.

1301 West Elizabeth Avenue, Linden, New Jersey
Plants: Linden, N. J.; Bloomfield, N. J.; Elizabeth, N. J.

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BUFFALO 14, N. Y. 3053 Main St.

effective that no radiation is measurable on a 0 to 25 milliroentgen per hr. meter.—*Central Scientific Co., 1700 Irving Park Rd., Chicago, Ill.*

Equipment Cost Indexes

(Marshall & Stevens Indexes, 1926 = 100)

Industry	Sept. 1952	June 1953	Sept. 1953
Average of all	180.5	181.9	182.6
Process Industries			
Cement mfg.	172.7	173.6	174.3
Chemical	181.1	182.0	182.7
Clay products	167.7	168.5	169.2
Glass mfg.	171.1	172.0	172.7
Paint mfg.	174.4	175.3	176.0
Paper mfg.	174.7	175.6	176.3
Petroleum ind.	177.8	178.7	179.4
Rubber ind.	180.2	181.1	181.8
Process ind. avg....	178.6	179.5	180.2
Related Industries			
Elec. power equip...	183.0	183.9	184.6
Mining, milling	182.1	183.0	183.7
Refrigerating	200.9	202.2	203.1
Steam power	170.7	171.6	172.3

Compiled quarterly for March, June, September and December of each year by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. Indexes are prepared for 47 different industries, from which the eight process and four related industries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, **Chemical Engineering**, Nov. 1947, pp. 124-6. For a listing of annual averages since 1913 see **Chemical Engineering**, March 1953, pp. 220, 221.

Micro-Microammeter Gives Accuracy at Low Cost

High precision and stability feature the newest low-cost micro-microammeters for commercial use. These instruments can be used for measuring, recording and controlling micro currents on the order of one millionth of a millionth of an ampere.

Practical application of these instruments is for measuring the effect of radioactivity on ion chambers or similar devices. Thus they can be used for monitoring and controlling liquid levels, thickness of moving sheets (textile, paper, plastic, etc.), thickness of coating or amount of impregnation and particle size of granular material.

Basic unit of this new instrument is a unique vibrating reed modulator. It is sealed in a glass envelope and can be replaced as easily and inexpensively as a conventional vacuum tube.

Readings with the Model V micro-microammeter are independent of line voltage fluctuation from 103 to 107 v. A comparison logarithmic scale micro-microammeter with a wide current range on a single scale has been designed for use where input currents are likely to fluctuate. — *Beckman Instruments, Inc., South Pasadena 1, Calif.*

IN BRIEF—A capsulated listing of this month's newsworthy equipment.

New Instruments & Controls		Page
Hydrogen Analyzer	Uses beta rays to give percentage hydrogen	278
Micro-Microammeter	Measures radioactivity effect on ion chambers	280
Liquid Level Controller	Operates over wide temperature-pressure range	280
Mercury Dial Thermometer	In miniature size for panel mounting	280
Temperature Control Valve	Eliminates rupture hazard with metal diaphragm	280
Spectrophotometer	Runs accurate analyses automatically	280
Recording Spectrophotometer	Offers greater sensitivity, faster operation	280
New Electrical & Mechanical Equipment		
Trouble Lamp	For portable use is explosion-proof	282
Chemically Resistant Motors	Employ epoxide resin to protect windings	282
Motor	Withstands exposure to abrasive atmospheres	282
Roller Bearing	Carries increased loads, has longer life	282
Flexible Coupling	For high speed and torque is sturdy and light	282
Tubing Bender	Bends 5/8 and 7/8 in. tubing to same radius	282
New Processing Equipment		
Dewatering Centrifugal	Now has new feeder and hot air dryer	284
Liquid-Liquid Extractor	Built as column uses mix and settle principle	286
New Materials of Construction		
Glass-Lined Smokestack	Resists corrosion from acid condensate in smoke	288
Tough Concrete Flooring	Contains latex binders for improved resilience	288
Nickel Alloy	Can be used up to 2,200 deg. F., gives long life	288
Cemented Chrome Carbide	In many grades for nozzles, valves and orifices	288
New Facilities	For fabricating metals include Nicro-Brazing	288
New Fluids Handling Equipment		
Vapor Dome	On large storage tanks cuts loss of volatiles	290
New Packaging & Handling Equipment		
Bagging Machine	Packs free-flowing solids in record time	292
Packing Conveyor	Doubles output of 2-man packing team	292
Metallizing Wire	Protects wear surfaces with molybdenum coating	288
Metallizing Wire	Protects wear surfaces with molybdenum coating	288
Coding Machine	Marks up to 90 packages per minute	292
Rotary Dumper	Mounted on truck forks rotates 190 deg. forward	292
Car Vibrator	Is mounted in place by hydraulic clamp	292

Liquid Level Controller Reacts to Capacity Change

An electronic level controller detects the level of liquid, foam, liquid-liquid interfaces or granular solids. It works equally well with viscous fluids.

Controller reacts to a change in capacity when probe is covered by a liquid or other flowable material. Capacity change causes a radiofrequency oscillator to reduce or completely stop its oscillation. This capacity change is used to generate a d.c. voltage signal. Amplification of signal operates relay.

Probe is about 6 in. long and coated with Teflon. Pipe threads permit it to be inserted into vessels. It can be used over a wide range of temperatures and pressures.—*Instruments, Inc., 122 North Madison, Tulsa, Okla.*

Miniature Dial Thermometer Actuated By Mercury

When panel or mounting space is limited you can use the new miniature mercury actuated dial thermometers. They are designed primarily for application where larger standard mercury dials cannot be used.

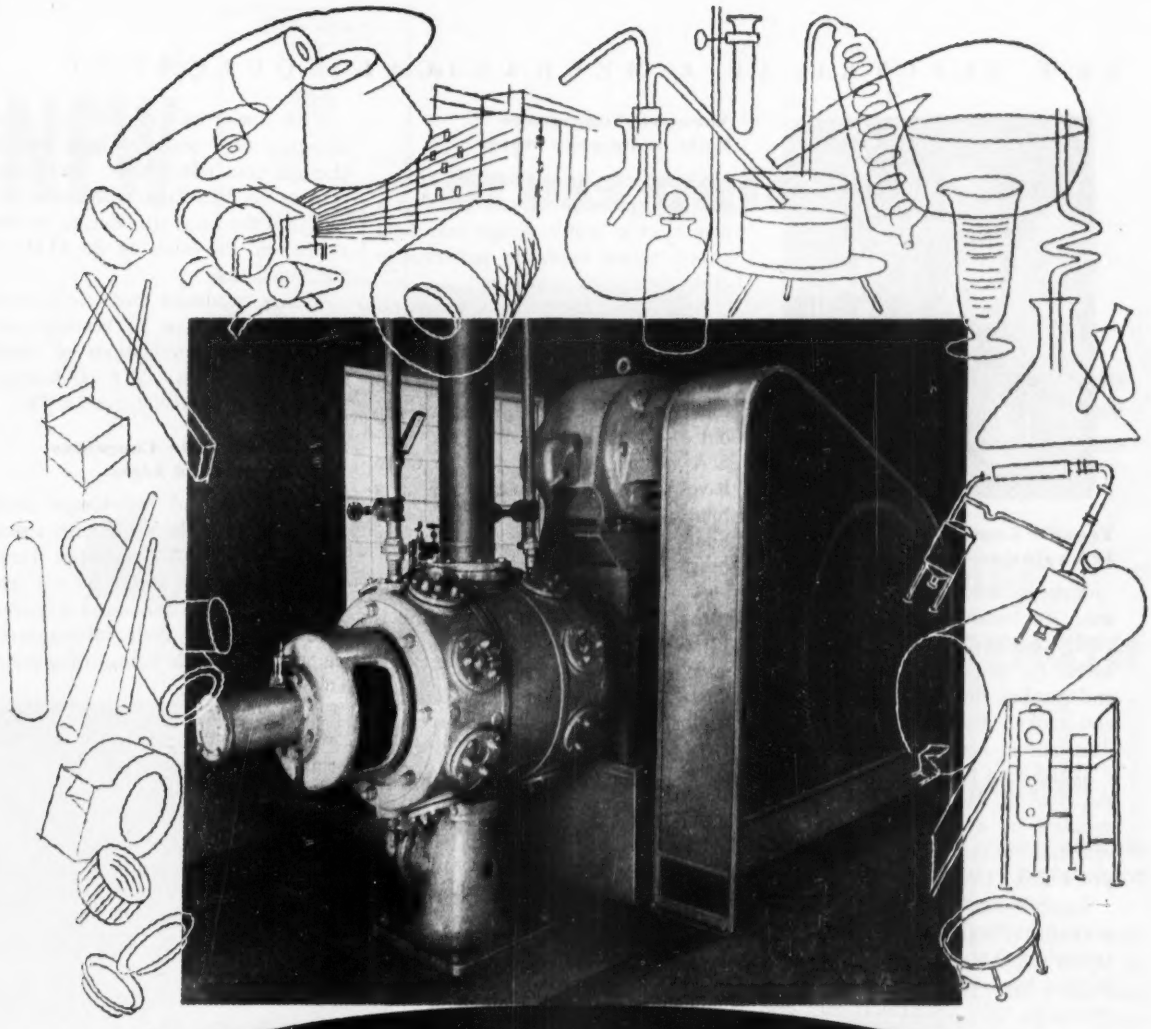
Instrument is only 2½ in. in diameter. The bulb is approximately half the length of a standard size bulb. Instruments exhibit the accuracy, sensitivity, ruggedness and uniform dial graduation inherent in all mercury dial thermometers.

Thermal system is all stainless steel and movement is bronze. Thermometer is available in all standard ranges with a variety of bulbs and connections.—*United States Gauge, Div. of American Machines & Metals, Inc., Dept. MM, Sellersville, Pa.*

Temperature control valve has a patented sliding gate that wipes across an orifice plate. Use of a metallic diaphragm eliminates rupture hazards.—*Jordan Regulator Corp., 1609-10 Carew Tower, Cincinnati 2, Ohio.*

Spectrophotometer runs analyses automatically with accuracies matching or exceeding the best manual operation. Once controls are set the instrument can run by itself. An operator is needed only to change sample, chart paper and scanning regions.—*Beckman Instruments, Inc., So. Pasadena 1, Calif.*

Recording spectrophotometer has been redesigned with emphasis on accurate color measurements, greater sensitivity and faster operation. Instrument can furnish a rapid color analysis in 54 sec. It gives photometric accuracy of 0.5 percent, wavelength accuracy within 1.0 millimicrons and photometric precision within 0.2 percent.—*General Electric Co., Schenectady 5, N. Y.*



Protect Products

WITH CP OIL-LESS CYLINDER COMPRESSORS

If you use air for operating instruments or if you process chemicals, beer, food or other products where oil-laden air would be a detriment, you need a Chicago Pneumatic Oil-Less Cylinder Compressor.

Available in three types, CP Oil-Less Compressors have carbon piston rings — need no oil or other lubricant. The Class T-BO illustrated above has a full-floating piston with an outboard crosshead. Piston weight is not carried by the cylinder wall or the carbon rings — rings act only as a compression seal against the hardened steel cylinder liner. A distance piece between cylinder and frame, and carbon piston rod packing prevent transmission of oil into the cylinder from the frame.

For more details, write for Bulletin 728 Supplement D.

Chicago Pneumatic *8 East 44th Street, New York 17, N. Y.*

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Trouble Lamp Is Explosion-Proof

This portable trouble lamp can be used at hazardous locations where explosive gases or vapors exist. It is useful for inspecting interiors of oil and gasoline drums or process vessels and tanks. Also it can be used for illuminating inaccessible gages.

Light from the lamp is similar to a powerful flashlight beam. Light is supplied by a 12-v. auto lamp. An essential accessory is an explosion-proof 120/12-v. transformer.

Lamp is constructed of a cast aluminum cylindrical lamp chamber, concentrating lens, composition handle, support hook and explosion-proof cord connecter with mechanical cord grip. Lamp housing is strong enough to withstand well over four times any conceivable pressure from an explosion within the housing.—*Crouse-Hinds Co., 7th & North Sts., Syracuse, N. Y.*

Motor Windings Resist Corrosion and Water

Experimental production has started on a line of chemical motors using 100 percent epoxide resin as protective varnish. During manufacture of motors, stator assemblies are impregnated with protective varnish and bake hardened. This keeps starting and running torque from spreading coil wires apart.

For chemical plant operation epoxide varnishes offer several distinct advantages in protection of motor coils. These varnishes have higher corrosion resistance. The hardened coating stands up to continuous operation at 250 deg. C. Water resistance is excellent.—*The Louis Allis Co., Milwaukee 7, Wis.*

Abrasive Atmosphere Fails to Damage Motor

Developed to withstand atmospheric suspensions of taconite dust a new electric motor design may help answer motor operating problems in other abrasive atmospheres.

By nature taconite combines extreme abrasiveness with magnetic properties. The dust is so fine it takes eight hours to settle in a draft-free room—thus it's very difficult to keep out of bearings.

A motor design that appears to have licked this problem utilizes a rotating slinger on the motor shaft. Slinger action keeps dust out of the bearings.

A breather tube equalizes air pressure inside the motor. This tube is fitted with a combination mechanical and magnetic filter to prevent any passage of abrasive material into the motor enclosure.—*The Louis Allis Co., Milwaukee 7, Wis.*

Improved Roller Bearing Carries More, Has Longer Life

An improved spherical roller bearing has from 25 to 50 percent greater antifriction bearing capacity. Service life now is 2 to 3½ times longer than formerly possible. These outstanding improvements have been accomplished without any change in size or weight of bearing.

Inner race of the bearing is designed without undercuts and integral flanges. Capacity is increased because longer rollers are used. More effective contact is secured.

A separate guide ring between the two rows of rollers allows them to take the most advantageous load-bearing position.

Each row of rollers is held in a window-type cage made of high tensile strength cold rolled brass. Each cage centers on two large areas, one directly on the inner ring outside of the rollers and the other on the O.D. of the guide ring.

Where combined loads are present the improved type C bearings can carry heavier combinations of radial and thrust loads.—*SKF Industries, Dept. 616-A, Philadelphia 32, Pa.*

Geared Flexible Couplings Are Sturdy and Light

High-speed and high-torque shaft connections can be made with a new line of geared flexible couplings. These couplings combine sturdiness and light weight. They accommodate a reasonable amount of shaft misalignment and end float while transmitting power efficiently.

Two-section free-floating housing has internally cut gear teeth. The two sections are rabbet fitted and bolted together. They function as a single rigid unit forming a dust-proof lubricant-retaining enclosure.

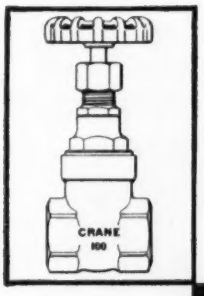
Ten standard sizes are available. Bores range from 1 to 6 in. Horsepower rating is from 2 to 450 at 100 rpm. Hubs can be furnished bored for either slip or shrink fit on shaft.—*Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.*

Copper Tubing Bends With Ease

Both ⅝ and ⅞ in. O.D. tubing of either hard or soft copper are easily bent with the TT-57 tubing bender. Tool is made of light-weight metal and weighs only 6 lb.

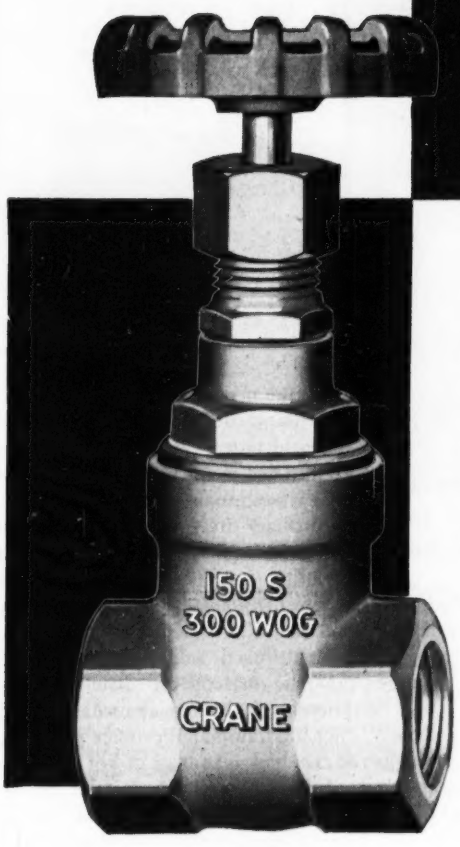
Tube forming section is designed so that both sizes of tubing are bent to the same radius. This makes a neater looking job when different sizes of tubing are used in parallel runs.—*Tal Bender, Inc., Milwaukee 2, Wis.*

NEW* brass gate valves



No. 410,
100-Pound

No. 438,
125-Pound



No. 437,
150-Pound

by

CRANE

* NEW SHAPE... NEW STRENGTH

for 3 All-Time CRANE *favorites*

Here are valves that didn't have to be changed . . . because each has long been the best in its class. But Crane found ways of improvement to give you an even better buy for your brass valve dollars.

For example—here is greater strength, greater rigidity, made possible by the new cylindrical upper body . . . the same basic shape as high-pressure steel valves. Here, too, is an improved stuffing box that screws *into* the bonnet—also better stem support to assure truer alignment and minimize wear on the packing.

And not to be overlooked is their clean, modern appearance—a very desirable advantage for all of your "exposed" installations. Sizes ¼ to 3 in. Ask your Crane Representative all about this improved brass valve line next time he calls.

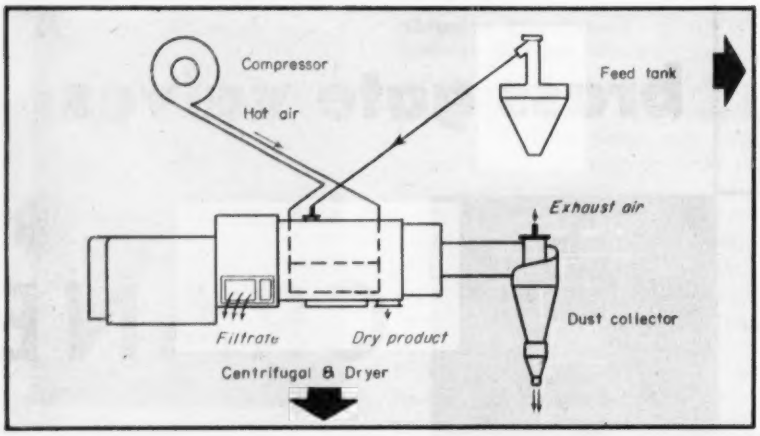
just off the press...
new four-page folder with complete facts including sizes, prices and dimensions. Send for yours today. Ask for Brass Valve Folder AD1944.

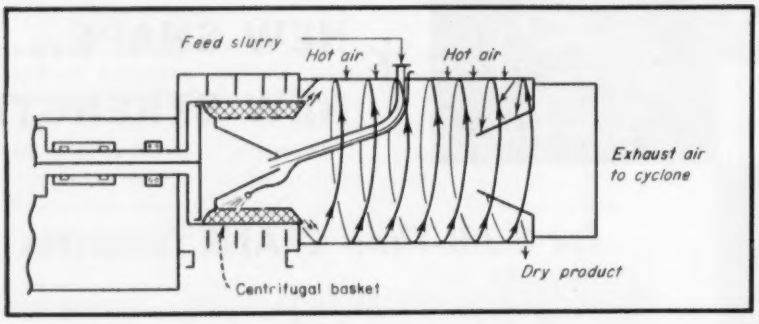
THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

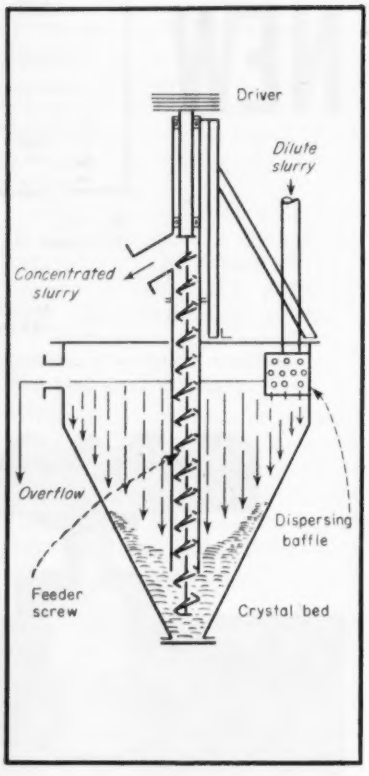
CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING







Better Wringing, Dry Product

These are improvements reported for a crystal-dewatering centrifugal. A new feeder and an integral hot-air dryer give smoother operation and a finish-dried product.

In dewatering operations on relatively coarse solids there are definite advantages in providing a concentrated slurry to the centrifugal. Yet in many instances it is difficult to attain a smooth operation in producing and feeding a slurry with high solids to liquid ratio.

With introduction of its new Concentrating Feeder, Baker Perkins claims to have a more effective device for concentrating and feeding a slurry. It assures peak centrifugal performance with minimum attention.

Feed rate of concentrated slurry to the centrifugal is uniform despite surges in slurry rate and concentration entering the feeder. Output from the feeder varies automatically with changes in the average rate of solids input to the feeder.

By feeding concentrated slurry at a uniform rate the danger of unbalanced loads in the centrifugal basket has been overcome. Also the absence of orifices or throttle valves prevents plugging, eases servicing and maintenance problems.

Feeder construction is shown above. Slurry enters the settling cone through a dispersing and straining baffle at the top. Solids settle into the cone. Clarified liquor overflows from the top. The revolving, vertical screw lifts the settled solids to the feeder outlet.

Screw speed is generally variable. Solids concentration at the feeder outlet is controllable up to 90 percent. For stubborn solids an agitator can be installed to keep them moving down the cone.

Feeders can be furnished for solids outputs from 1,000 to 83,000 lb. per hr.

On the downstream end of the centrifugal Baker Perkins has eliminated the need for supplementary drying equipment. A recently developed and field tested Centrifugal Dryer can be installed as an integral part of the type S continuous centrifugal.

Auxiliary dryer mounts directly on the centrifugal housing. It delivers a smooth, fast flowing, continuous stream of product with moisture content as low as 0.01 percent.

Centrifuged solids are discharged into the rear of the dryer housing. They are picked up immediately and circulated around the inner periphery of the dryer by a blast of hot air.

Internally projecting spiral baffles direct the combined stream of hot air and solids toward the forward end of the dryer. At each revolution an additional air blast entering through adjustable orifices reaccelerates the particles.

At the discharge point excess air is exhausted through the vortex cone into the exhaust housing, then into a cyclone dust collector. Main portion of the dried solids drops out of the air stream at the vortex cone and is diverted through discharge openings.—*Baker Perkins, Inc., Chemical Machinery Div., Saginaw, Mich.*

PROVIDES
SPEED
AND
AUTOMATIC QUALITY CONTROL

...for the MURRAY COMPANY (Division of H. A. Johnson Co.)

PROBLEM:

High labor charges and uncertain accuracies in loading sugar to syrup kettles presented a challenge to the cost- and quality-conscious management of the H. A. Johnson Co.

SOLUTION:

A suitable conveyor system feeding a Richardson Automatic Scale provided high volume, controlled accurate flow of sugar to the cookers. Another alert management had reduced their labor charge to practically nil and incorporated machine-made, repetitive accuracy into their process.

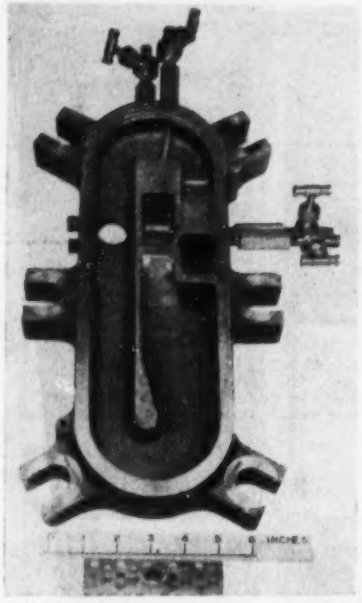
Rising labor costs *can* be offset while still maintaining both quality and quantity production. Proof of this is the Richardson installation pictured, recently completed for the Murray Company, Division of the H. A. Johnson Co., Boston, Mass. Adopting the recommendations of a Richardson field engineer, this well known manufacturer of soda fountain syrups and toppings has actually increased output at reduced unit cost. At the same time product quality is now rigidly controlled, *automatically*.

Materials handling by weight has been a Richardson specialty for more than fifty years. And every year has seen more practical applications throughout the processing industries of this wide range of experience.

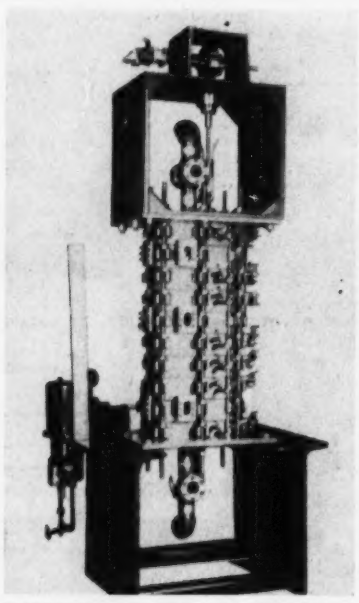
At no obligation to you, a Richardson engineer will gladly call, survey your present methods, and show you the Richardson way to lower costs through efficient materials handling by weight.

Richardson
MATERIALS HANDLING BY WEIGHT SINCE 1902

Richardson Scale Co., Clifton, New Jersey. Automatic Weigher Systems of All Types: Automatic Bulk Weighing Hopper Scales, Including Conveyor-Feed Types • Continuous Feeder-Weighers • Automatic Bagging Scales • Bag Sewing Conveyors Packers • Multi-Material Proportioning • Process Control Panels. *Branch offices in:* Atlanta • Boston • Buffalo • Chicago • Detroit Houston • Minneapolis • New York • Omaha • Philadelphia Pittsburgh • San Francisco • Wichita • Montreal • Toronto.



TRAY contains two extraction stages.



COLUMN is composed of stacked trays.

Liquid-Liquid Extractor . . .

. . . Brings new simplicity to multi-stage liquid-liquid extraction. Each tray in column operates as a pair of mix and settle stages. Individual stages have sampling cocks.

As a unit operation liquid-liquid extraction of the multi-stage variety is frequently limited by complexity of equipment and operation.

One of the most effective methods for multi-stage extraction is the use of a number of mix and settle units. Normally this may consist of a series of tanks and mixers occupying considerable floor space.

Advantages of the mix and settle principle now have been incorporated in a space-saving column-type extractor. Outstanding features include:

- Provision for sampling the liquid phase from each individual stage.
- Separate passages between each pair of stages for the flow of heating or cooling medium.
- Ability to operate the column with different temperature conditions on individual stages to give a temperature gradient along the column.
- Built-in observation windows on individual stages.
- Provision for varying flow rate and degree of agitation.

Individual tray castings incorporate a pair of stages. Pictured above is a tray with the upper stage visible. Around the outer periphery are lugs for bolting the individual castings into the complete stack assembly.

Liquid phases are sampled separately through the petcocks. On the right hand side of the tray you can see openings through which the two liquid phases enter and leave the stage.

Entering streams pass from the far-end of the tray down the left-hand side along the channel. At the near-end they make a return bend flowing back along the other side of the tray to the discharge opening.

A suitable weir arrangement at the discharge point provides good separation of the two liquid layers. The bottom or denser layer is directed downward onto the next stage below. The upper or lighter layer goes upward in the column to the stage above.

Mixing and intermingling of the liquid phases take place near the point of entry to the stage. A long shaft passes down through the column in the location shown by the circular opening. Attached to the shaft within each tray are two rectangular perforated plates. As the shaft moves up and down the perforated plates provide intermingling of the liquid phases.

Once the liquids have passed the agitator plates they immediately start to coalesce and separate into two layers. By the time they have reached the end of the stage and doubled back to the discharge ports they have separated into two distinct layers.

Agitator shaft movement is governed by a hydraulic motor which drives the shaft through a cam. Both speed and amplitude of shaft movement are readily adjustable.

The denser liquid phase enters at the top of the column; the lighter at the bottom. Both liquids are pumped into the column by hydraulic motors. These motors and the one operating the agitator shaft all can be operated from the same hydraulic system.

Shown above is a 20 stage column which has a total height of 7 ft. including the base and overhead agitator drive. Actual height of the 20 extraction stages is only about 3 ft.

This present model is satisfactory for production of fine chemicals and pharmaceuticals. Also it may be used on development work for large petroleum industry extraction units.

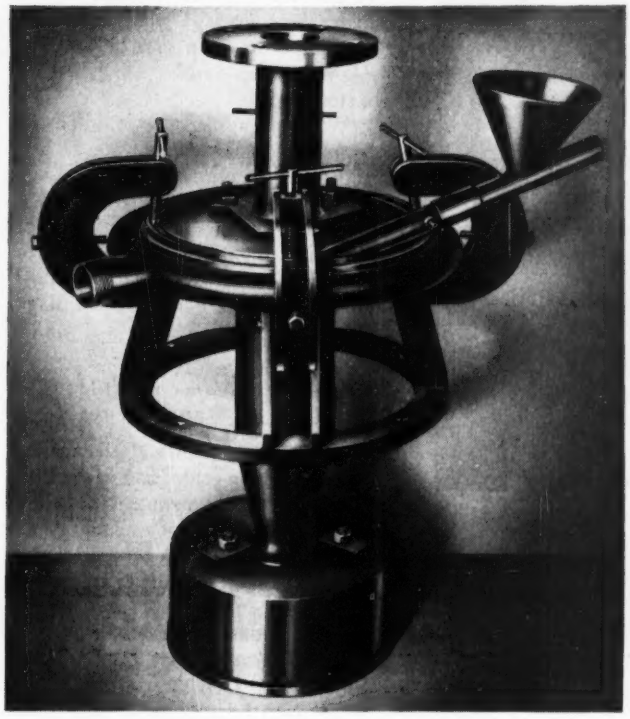
On petroleum extraction operations this model has a throughput in the range from 4 to 10 gph. On a 20 stage unit liquid hold-up within the column is approximately 3 gal. Total liquid depth on a stage is 1 in.

Extraction decks can be cast of iron or the more corrosion-resistant alloys. Sealing surfaces of the decks are machined smooth and sealed with material such as Teflon. Similar seals are used for agitator shaft on each stage.

Extractor was developed under a university research program supported by the Standard Oil Development Co. Unit is licensed to National Research Corp.

Among the systems handled successfully with this unit are phenol-lube oil, water-kerosene, caustic soda-naphtha and liquid ammonia-naphtha. The last named system indicates the unit's ability to operate under pressure.—*National Research Corp., 70 Memorial Drive, Cambridge 42, Mass.*

Announcing the STURTEVANT



MICRONIZER*

Pulverizing Machine for Reducing Materials to Micron Sizes

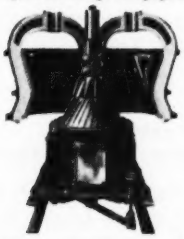
A fluid jet pulverizing machine, the Sturtevant *Micronizer* speeds reduction of materials to low micron sizes. These jet mills are especially applicable in fields where a particle size in microns is desired.

Sturtevant *Micronizer* mills are used throughout industry for reducing non-metallic and metallic minerals and ores, pigments, insecticides, fungicides, pharmaceuticals, plastics, dyes, and numerous other organic and inorganic products.

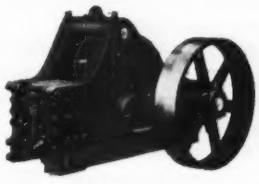
Sturtevant *Micronizer* pulverizers are available in many sizes and capacities. Write for information.

Other Sturtevant Pulverizing Equipment for Rapid Reduction of Materials...

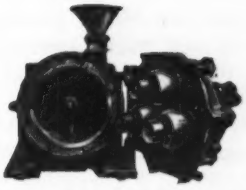
Especially Applicable for Initial Grinding of Products for the Micronizer Mill



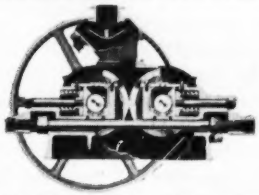
ROTARY FINE CRUSHERS for intermediate and fine reduction (down to ¼"). Open door accessibility. Soft or moderately hard materials. Efficient granulators. Excellent preliminary Crushers preceding Pulverizers.



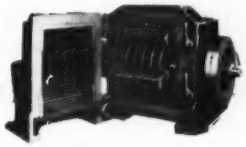
JAW CRUSHERS for coarse, intermediate and fine reduction of hard or soft substances. Heavy or light duty. Cam and Roller action. Special crushers for Ferro-alloys. Several types, many sizes.



RING-ROLL MILLS for medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operated in closed circuit with Screen or Air Separator. Open door accessibility. Many sizes. No scrapers, plows, pushers, or shields.



CRUSHING ROLLS for granulation, coarse or fine, hard or soft materials. Automatic adjustments. Crushing shocks balanced. For dry or wet reduction. Sizes 8 x 5 to 38 x 20. The standard for abrasives.



SWING-SLEDGE MILLS for coarse and medium reduction (down to 20 mesh). Open door accessibility. Soft, moderately hard, tough or fibrous substances. Built in several types and many sizes.

AIR SEPARATOR for separation of fines to 325 mesh and finer. Increases output from 25% to 300%... lowers power costs by 50%. Capacities ¼ to 50 tons per hour output.

*Registered trademark of the Sturtevant Mill Company

STURTEVANT MILL COMPANY

100 CLAYTON STREET, BOSTON 22, MASS.

DESIGNERS & MANUFACTURERS OF DENS AND EXCAVATORS • MIXERS • SCREENS • PULVERIZERS • ELEVATORS • AND COMPLETE FERTILIZER UNITS

GLASS LINING COMBATS SMOKESTACK CORROSION

With erection of this industrial smokestack the pioneering step was taken in use of glass-lined steel for industrial stacks. Coated inside and out with two 0.005-in. glass linings, the stack will resist corrosion from acid condensate in the smoke. If life of this unit checks earlier tests there should be cutbacks from the present level of 5,000 stack replacements per year.—A. O. Smith Corp., Milwaukee, Wis.

Latex Binders Toughen Concrete Flooring

Special latex binders impart toughness, flexibility, and water resistance to a new line of flooring and surface coating materials. Similar in nature to regular concretes or plasters, these materials will bind to masonry, concrete, plaster, wood, glass, and various metals.

One variation of the Surco coating has outstanding waterproofing qualities. Another is outstanding for wear resistance.

Thin layer of material needed for flooring obviates need for structural changes to support it. In addition, use of less materials means lower cost and easier, less expensive installation. Applied as a flooring, Surco coatings have woodlike resilience and resistance to traffic impact far superior to concrete fortified with the best hardeners.—*Surface Coatings, Inc., Dept. B-1 110 Pear St., Atlanta, Ga.*

Sprayed Molybdenum Finds Widening Applications

Use of Sprabond molybdenum wire is finding increasing use as a metallizing material for building up wearing surfaces. Experience has shown Sprabond to have outstanding wear resistance when running against bronzes. Life of the bronze mating surfaces is greatly increased. Similar results have been observed on applications involving babbitt or other white metal bearings.

Another promising application for this type of surfacing is where abrasive wear exists without excessive shock or impact.

This metallizing material bonds well to most aluminum or magnesium alloy. Thus high-speed rolls, pulleys, etc. made of light-weight alloys may be suitably protected on critical wearing surface by application of sprayed molybdenum.—*Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City 1, N. Y.*

Nickel Alloy Extends Heat-Resistant Range

With the lifting of Government NPA order M-80, limiting the use of nickel, a new heat-resistant alloy NA22H becomes generally available. Alloy can be used at temperatures up to 2,200 deg. F. This is 200 deg. F. above the previous design limit for heat-resistant alloys.

Use of NA22H permits increased furnace capacity and efficiency. Rate of heating is upped through use of higher heat heads. Design is practical for temperatures up to 2,200 deg. F. Alloy's life is longer per dollar invested.

While possessing unique properties for operation above 2,000 deg. F. this alloy also has advantages in the range from 1,700 to 2,000 deg. F. It is said to show big savings because of superior structural stability and resistance to oxidation.—*Blaw-Knox Co., National Alloy Div., 2042 Farmers Bank Bldg., Pittsburgh 30, Pa.*

Cemented Chrome Carbide Available in Many Grades

An unlimited number of cemented chrome carbide grades now is available for engineering experimentation. Expansion of the range of available grades is expected to open up many new uses for this versatile metal.

Included in the new grades of cemented chrome carbide are a number of more wear-resistant compositions. In addition there are a number of grades with higher erosion and corrosion resistance.

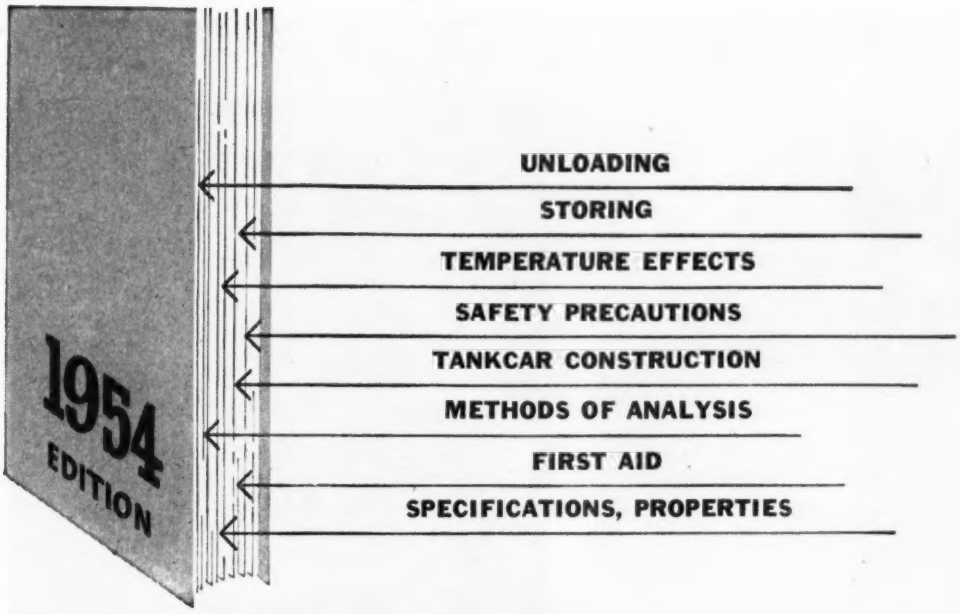
Uses to date show chrome carbide to be outperforming other metals in spray nozzles, steam valves and orifices for processing foods, soaps and drugs. —*Carboloy Dept., General Electric Co., Detroit 32, Mich.*

Alloy Fabricator Adds New Brazing Equipment

New manufacturing facilities now are available for fabrication of stainless steel and other high nickel alloys. Facilities include the Nicro-Brazing process. Technique is said to be one of the few that gives satisfactory strength and corrosion resistance at high temperatures.

Nicro-Braze (nickel chrome) alloy forms an entirely new alloy when brazed with parent metal in a dry hydrogen atmosphere. Ductility, shear strength, tensile strength and corrosion resistance of the new alloy are similar to that of the stainless steel parent metal.

Tensile strength of a Nicro-Brazed joint with stainless steel is 90 percent at room temperature, 106 percent at 1,600 deg. F. and 99.8 percent at 2,000 deg. F.—*Twigg Industries, Inc., Terre Haute, Ind.*



CELANESE* FORMALIN MANUAL

Your non-technical personnel will find the Celanese Formalin Manual clear, concise, and easy-to-follow. Based on years of field experience with Formalin, this 1954 Edition has been brought completely up-to-date with the latest handling and storing procedures.

For technical personnel, it describes effects of temperature, basic reactions causing paraformation, and general information concerning construction materials for storage and handling equipment.

Users of Formalin will find this manual valuable in bridging the gap between engineers and non-technical operators. It is a must for plant safety training programs.

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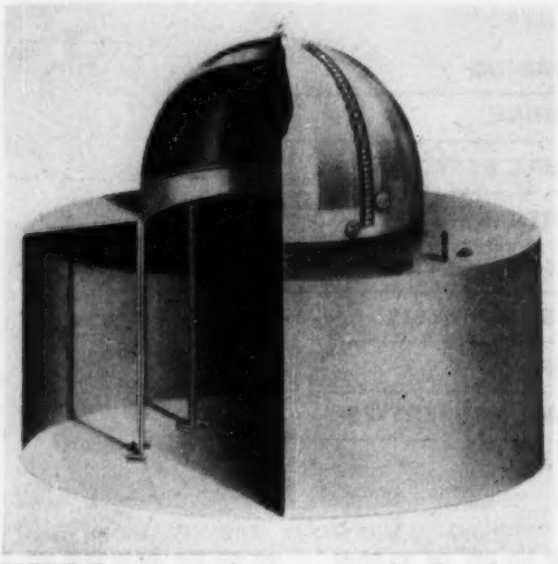
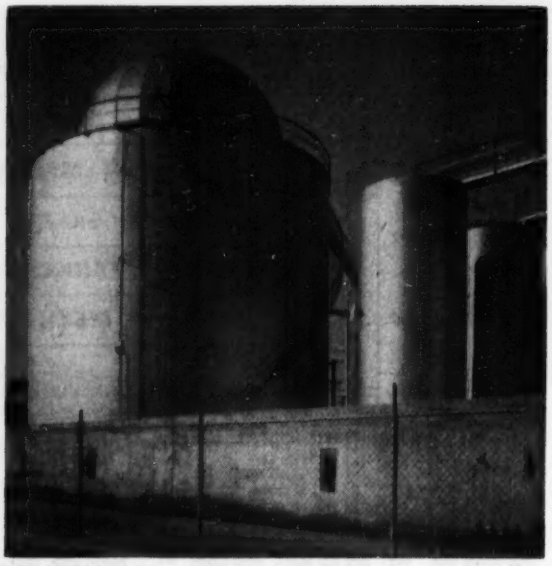


FLEXIBLE membrane in dome compensates for volume changes.



HORTONDOME installation at Shell Oil Co., Portland Ore.

Vapor Dome Cuts Storage Loss

It acts as a surge space for air-vapor mixtures over volatile liquids in storage. Air and vapor push into dome against movable membrane. Venting isn't necessary.

Vapor losses from bulk storage tanks are being drastically reduced through the use of expansion chambers to absorb surges in vapor volume. Device can be incorporated in storage tanks for crude oil, petroleum fractions, commercial solvents and other volatile chemicals.

Vapor dome can be used on individual tanks or as surge capacity for a multiple tank installation connected by a suitable vapor line. Either way the system is completely closed preventing escape of vapor to atmosphere. Safety vents are provided in case the vapor surge capacity is exceeded.

In the cutaway view above you can see the construction of this vapor-saving device. The Hortondome roof consists of a welded steel dome mounted at the center of a cone roof. A hemispherical flexible membrane having the same diameter as the dome is attached around its edge to the inside of the steel dome.

Membrane is free to hang downward in the form of a hemisphere. It is free to float on the vapor and is restrained only when the dome is completely full of vapor.

A weight at the center depresses the membrane at that point. This causes the outer part of the membrane to roll upward contacting the shell without rubbing as vapor expands upward. In this way the flexible material is subjected to minimum wear.

Membrane is fabricated of Chilon, a strong durable vapor-resistant material. Toughness is imparted by nylon cloth reinforcement. Specially compounded synthetic rubber applied on both sides of the nylon cloth provides good wearing and permeability characteristics. This combination of materials insures excellent physical properties for all temperatures.

When the dome is empty with the membrane hanging down, the space above the membrane is full of air. As vapor volume increases the flexible membrane rolls upward to provide space. Simultaneously an equal volume of air above the membrane is discharged through an open vent at the top. This displacement of air continues as long as the vapor expands.

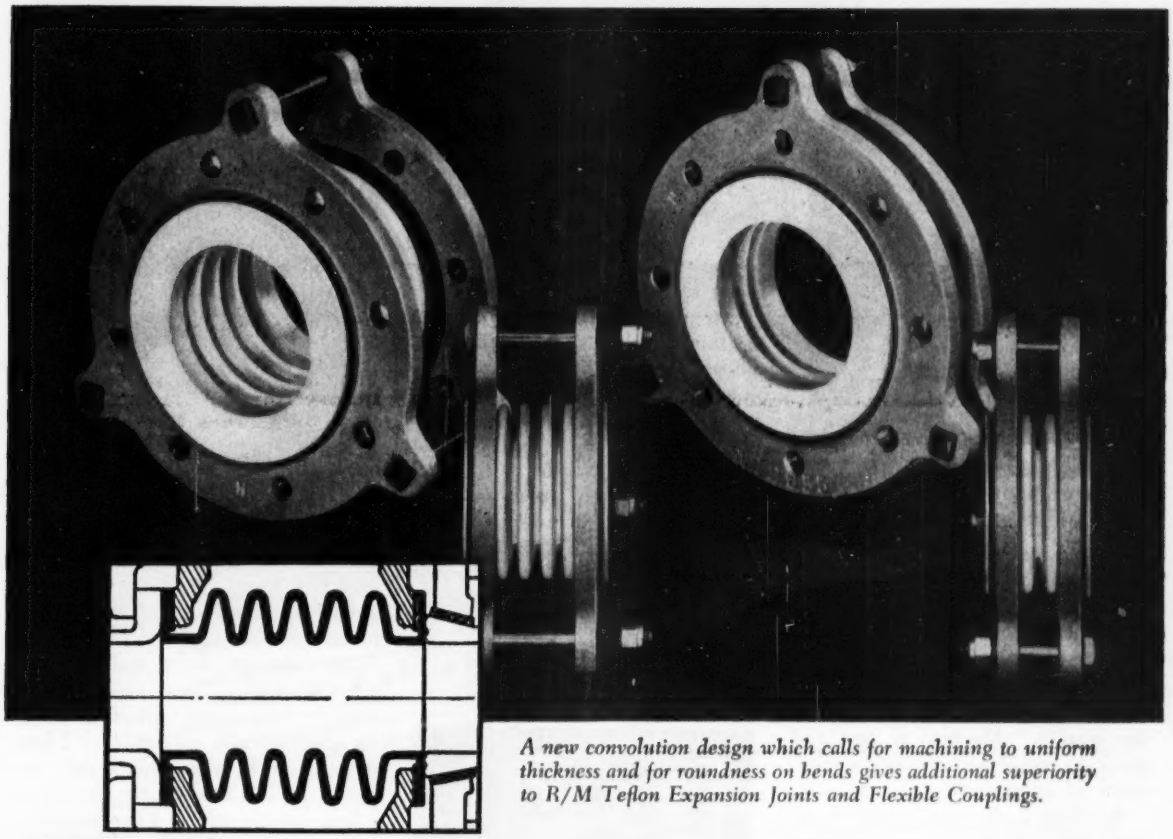
A conservation vent mounted on the structure protects the system against excessive pressure. This vent operates only when further expansion or contraction of vapor takes place after the membrane is completely inflated or deflated.

During inflation of the membrane vapor pressure is about ½ in. of water. This is the pressure required to lift the flexible membrane. Low pressure is maintained until full vapor capacity is reached. Pressure then goes up to the setting of the pressure relief valve.

In addition to the Hortondome there are two other variations of this vapor-saving design. One is the Vaporsphere, a spherical steel shell. The Horton Vaportank is a flat bottom steel tank with a dome roof.

Both Vaporspheres and Vaportanks are independent vapor storage units. They are interconnected to one or more gastight tanks forming vapor-saving systems.

One benefit of this vapor-saving design is its insulating quality. Temperature changes and consequent expansion of vapors are minimized. Also, the air-vapor mixture has a percentage of vapor that exceeds the upper flammable limit. Thus possibility of flame propagation is remote. *Chicago Bridge & Iron Co., 332 South Michigan Ave., Chicago 4, Ill.*



A new convolution design which calls for machining to uniform thickness and for roundness on bends gives additional superiority to R/M Teflon Expansion Joints and Flexible Couplings.

R/M Teflon* makes chemically impervious expansion joints and flexible couplings

Whatever your chemical connection requirements are, you can rest assured that R/M Teflon Expansion Joints and Flexible Couplings will meet your needs. R/M Teflon is ideal for such connections because it shows no reaction against chemicals. It is unaffected by any known industrial acids and caustics; it has no known solvent; its water absorption is zero, and weather does not affect it.

One outstanding construction feature of these R/M Teflon connections is the convolution design diagrammed above. The R/M design enables the joints and couplings to absorb greater shock and vibration. Another is the special tie rod arrangement which prevents overexpansion of joints and bending of pipes.

Protect your costly piping and equipment with R/M Teflon Expansion Joints and Flexible Couplings. See your R/M distributor for full details. The complete R/M Teflon products line includes rods, sheets, tubes, tape, packings, gaskets, rings, and irregular shapes.

**Du Pont's trade-mark for its tetrafluoroethylene resin*

R/M MAKES A COMPLETE LINE OF PACKINGS AND GASKETS AND SELLS THEM ONLY THROUGH AUTHORIZED DISTRIBUTORS

R/M PACKINGS
RAYBESTOS-MANHATTAN, INC.
PACKING DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.; Neenah, Wis.; Crawfordsville, Ind.; Peterborough, Ontario, Canada.

RAYBESTOS-MANHATTAN, INC., Packings • Asbestos Textiles • Industrial Rubber, Engineered Plastic, and Sintered Metal Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Bowling Balls

Bagging Machine
Packs Free-Flowing Solids

Free-flowing non-bridging solids are packed in record speed with the new Inglett and Corley bagger. Actual plant installations have packed 100 lb. open-mouthed multi-wall bags at the rate of 18 to 20 per minute.

Bagger is said to be the lowest cost automatic open-mouthed bagger on the market. Machine is easy and quick to install and requires a minimum of adjustment and repair.

Machine works equally well for all types and sizes of open-mouthed bags. Product can be pre-weighed, packed and the bag sewn closed with only two operators.

Bagger works in conjunction with a moving conveyor and sewing head. Weighing and filling cycle is completely automatic. When the operator pushes the starter button preweighed material is delivered through the machine's bag chute. The filled weight drops each bag onto a moving conveyor belt which moves it through the sewing head. — *Union Bag & Paper Corp., 233 Broadway, New York 7, N. Y.*

New Conveyor
Ups Bag Packing Rate

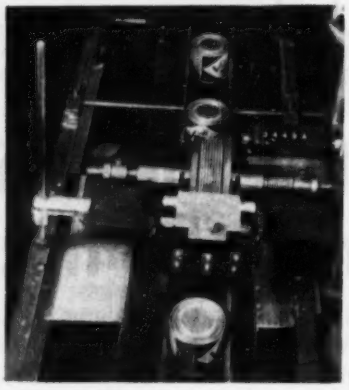
Two men can now equal the bag packing rate of three or four men through use of a new Y-shaped conveyor.

Conveying system consists of two 3-ft. spiral conveyors arranged as the arms of a Y, and a specially designed 7-ft. 3-in. V-belt sewing conveyor which forms the leg of the Y. Each of the two spiral conveyors passes through a packing station consisting of a filling and packing head and an automatic scale. The sewing head for sealing the bags is located over the V-belt conveyor.

A key feature of the conveying system is a controlling mechanism located at the receiving end of the sewing conveyor. It prevents spilling, tipping or twisting of the filled open bags as they pass from the spiral conveyors to the V-belt conveyor.

One operator is located between the spiral conveyors and the other at the sewing head. The packing operator loads one packer while the other packer is filling and packing a bag. This way there is no lost operator time while a bag is being filled.

Using automatic scales with oscillating or bounce packers the Y-veyor system turns out up to 16 100-lb. bags per min. Where automatic scales and auger packing are used the system can turn out 14 100-lb. bags per min.—*Richardson Scale Co., Van Houten Ave., Clifton, N. J.*

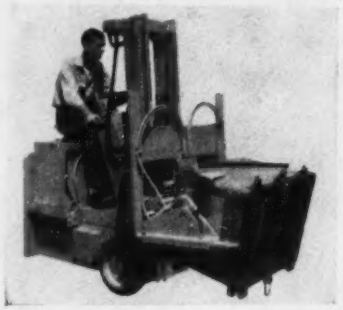


Coding Machine
Marks Package Tops

Economical fast coding of packaged materials is accomplished with a new type of coding and printing machine. Readily installed on any conveyor, machine will mark at the rate of 1 to 90 objects per minute.

User can adjust machine in a matter of seconds to mark the proper height and location. Near perfect registration is attained merely by adjusting the type on the printing wheel.

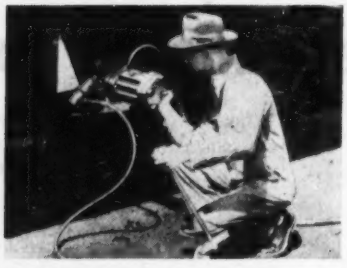
A fractional horsepower motor brings the printing wheel to the starting position after each impression. Motor disengages while the object is being marked. This allows the conveyor to dictate the speed of printing. —*Algene Marking Equipment Co., 232 Palisade Ave., Garfield, N. J.*



Rotary Dumper
Slips Onto Truck Forks

A new rotary dumping mechanism slips readily onto the fork of this FF-15 electric industrial truck. Conversion of the truck from fork to dumping operation is done in less than 20 min.

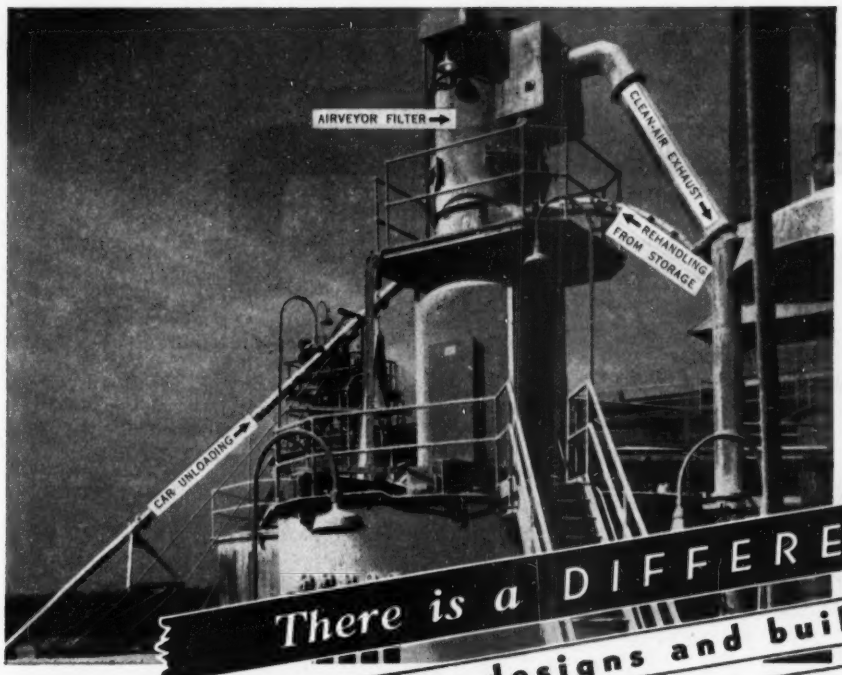
Unique dumping action permits forward rotation of 190 deg. Rotation is accomplished by a hydraulically-actuated pinion gear arrangement. Truck's permanently attached forks are hydraulically adjustable. Thus large or small size objects can be picked up and held by the clamping action.—*Automatic Transportation Co., 149 West 87th St., Chicago 20, Ill.*



Car Vibrator
Clamps on Hydraulically

Unloading of railroad cars can be speeded up through use of a new portable air vibrator. Equipped with a hydraulically-operated mounting clamp this type HCKR vibrator can be attached quickly to a railroad car or other material handling device.

After material has been removed from car the vibrator can be used to keep it moving into or out of hoppers, bins and chutes. It efficiently speeds the handling of sand, cement, coal or coke, limestone, cinders and many other materials.—*The Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland, Ohio.*



The Airveyor for unloading and conveying lime and salt cake in a paper mill.

There is a DIFFERENCE when Fuller designs and builds your conveying system

Fuller is not restricted to one design and construction but is able to select and apply the right system to conveying dry pulverized and granular materials most efficiently and economically . . . because, selection can be made from four types, or combinations, to meet conditions required: materials to be handled, capacity, distance of travel, and overall characteristics of the plant layout. In other words, each job is given individual study, before the proper equipment is selected and recommended.

Add to this, Fuller's 27 years of experience in the field of pneumatic conveying, and you have something that is hard to beat. It is something that is difficult, if not impossible, to write into specifications or show on blueprints, yet is inherent in Fuller equipment and engineering.

Fuller conveying systems can be installed without interfering with existing structures or equipment, with no production interruptions. Why not have us make a study of your conveying problems. Our findings and recommendations may give you an entirely new concept of conveying.

Write for Bulletin G-1, illustrating and describing the four conveying systems built by Fuller.

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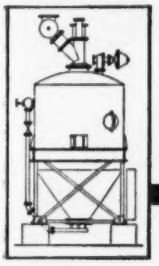

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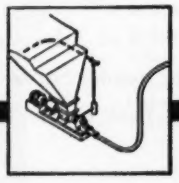

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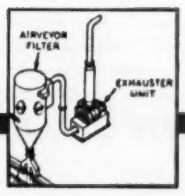

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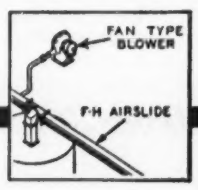

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GUIDED TOUR CONTINUED

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MnO_2 by Weeco method.

New process makes strategic battery-active MnO_2 from cheap domestic ores! That's the proud claim of the process described here. (*Flowsheet*)

Metals take bigger bites.

Last year fabricated metal products took over $1.4 billion of chemicals; look for this to grow fast. (*Economics*)

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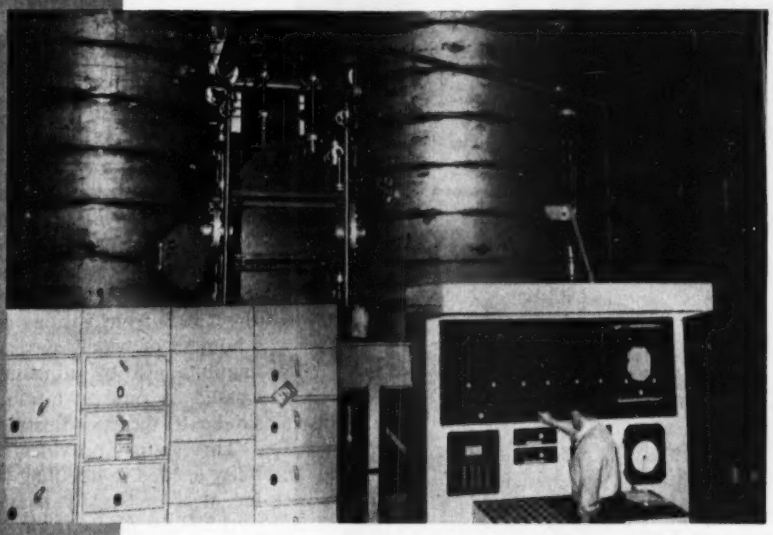

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Find out how you can avoid "down time" and eliminate scale removal costs.

Frequent switching removes scale in General American Conkey Evaporators with Rosenblad Channel Switching System*

The Rosenblad Switching System, as applied to Conkey Evaporators by General American, is a method whereby all surfaces subject to boiling liquor are periodically switched with surfaces in contact with the vapors and condensate. This periodic switching of the liquor and steam sides permits all fouled surfaces to be washed free of the newly forming scale by the dissolving and erosive action of the condensate, and also by temperature change.

This system of evaporation continuously concentrates liquors that otherwise scale the surfaces. It permits operation at full capacity rating with uniform high cleanliness of the evaporator heating, and all liquor contact, surfaces.

*Patented

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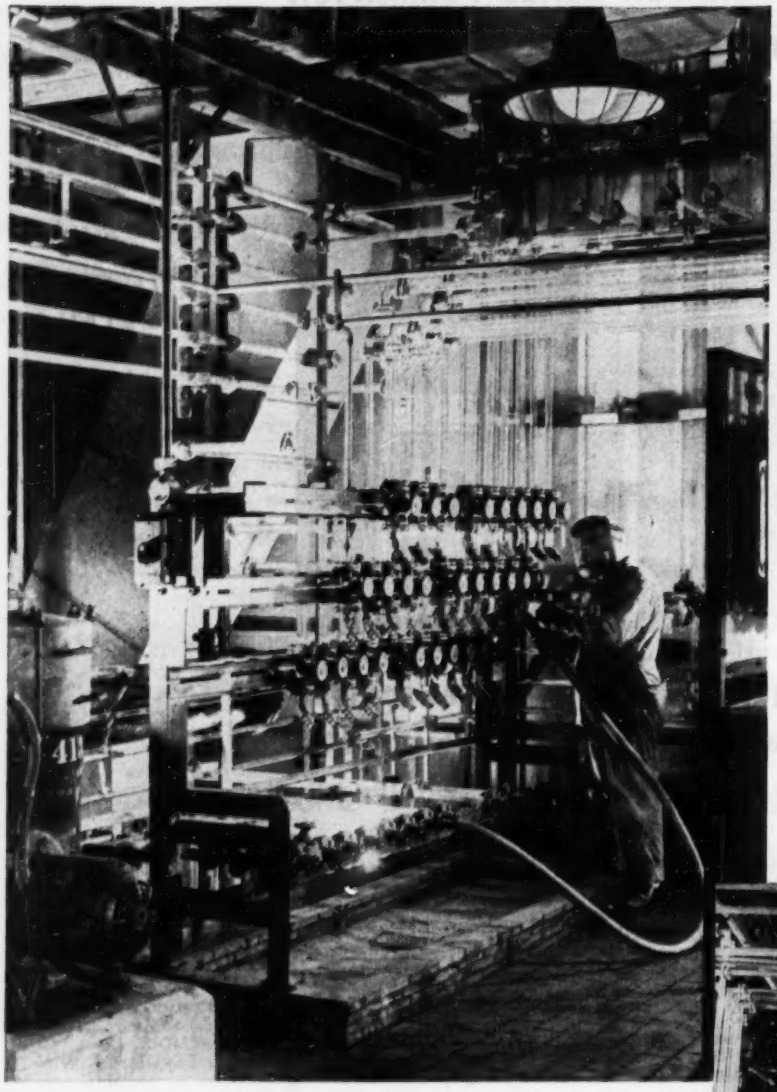
This PYREX® pipe an unusual

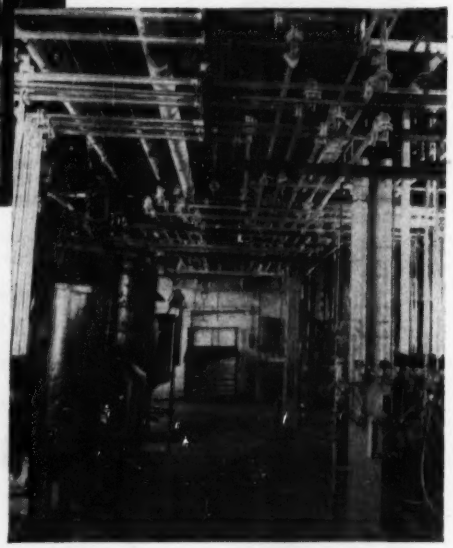


Operator at one of Merck's PYREX pipe "Switchboards" can cross-connect any of the glass pipelines in the manifold bank easily and quickly. The pipes are easy to clean and can be quickly switched to handling any number of different chemicals.

IF you toured the pilot plant of Merck & Co., Inc. in Rahway, N. J., you'd see this glass pipe "Switchboard" in action . . . speeding the progress of new products from research toward early production.

The system is constructed of one- and two-inch PYREX brand "Double-Tough" glass pipe arranged in circuits much like a telephone switchboard. Operators direct flow from various origins to a number of widely separated destinations just by adjusting valves located in pipe manifold stations similar to the two illustrated here.

This system provides the flexibility needed in handling the transfer of a constantly changing variety of chemicals from one processing stage to another. And Merck has constructed its PYREX pipe switchboard system so that it is instantly adaptable to handling materials with greatly different production cycles.



The handling of materials through this maze of PYREX pipe is easily controlled by several "Switchboard" or manifold stations. Transparency of the PYREX pipe lets operators check flow at any point in the line, spot difficulties before trouble has a chance.

CORNING GLASS WORKS, Corning, New York

"Switchboard" does materials handling job

But why PYREX pipe?

Merck chose PYREX pipe for this complicated installation because only glass offers them all four of these necessary advantages:

1. ***Non-Contamination*** — PYREX pipe is chemically stable. It won't react with or contaminate the contents of the pipeline. It protects product purity.

2. ***Corrosion Resistance*** — PYREX pipe remains corrosion free even under the severest chemical service. It is unaffected by *all* acids except hydrofluoric.

3. ***Clear Transparency*** — Affords complete inspection at any and all points at all times. Trouble can't hide behind glass.

4. ***Light Weight*** — PYREX pipelines require a minimum of support.

Easy to clean . . . in place

A detergent run through PYREX pipelines followed by water or low pressure steam flushing, or both, generally removes all traces of past contents.

And PYREX brand "Double-Tough" glass pipe is durable. Experienced users report no breakage problems . . . even with operating temperatures as high as 250° F. In addition, PYREX pipe can be installed by regular plumbers or pipefitters.

Let us show how PYREX pipe can help you

Perhaps this Merck installation suggests some PYREX pipe application for your plant where greater corrosion resistance, improved product purity, or visual inspection can reduce your operating costs or give you closer quality control. Why not discuss your problems with the nearest PYREX pipe representative—or mail the coupon below for personal attention or further information.

Call on the experience of the nearest PYREX pipe representative listed here. They will be glad to help you with your problems of handling corrosive or sensitive materials.

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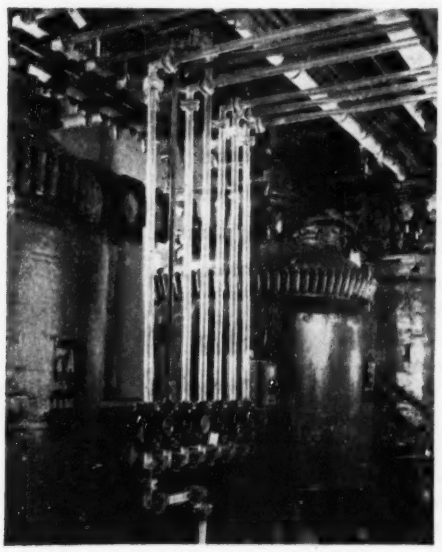

Another manifold station between two extractors. Liquids from either extractor flow through PYREX pipe to a pump on the floor then through any one of the PYREX pipes connecting with other installations.

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CORNING GLASS WORKS, Dept. CE-1, Corning, N. Y.

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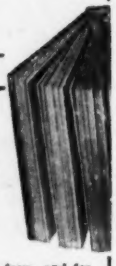

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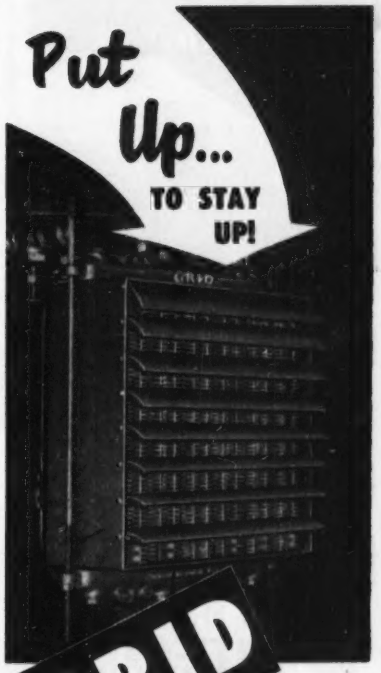

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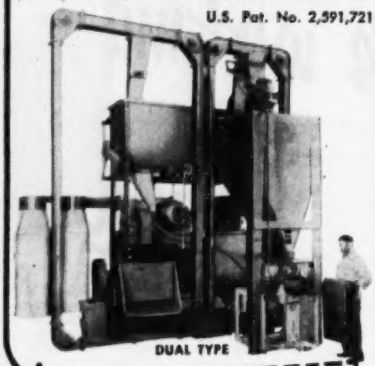

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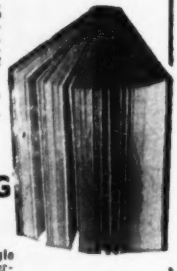

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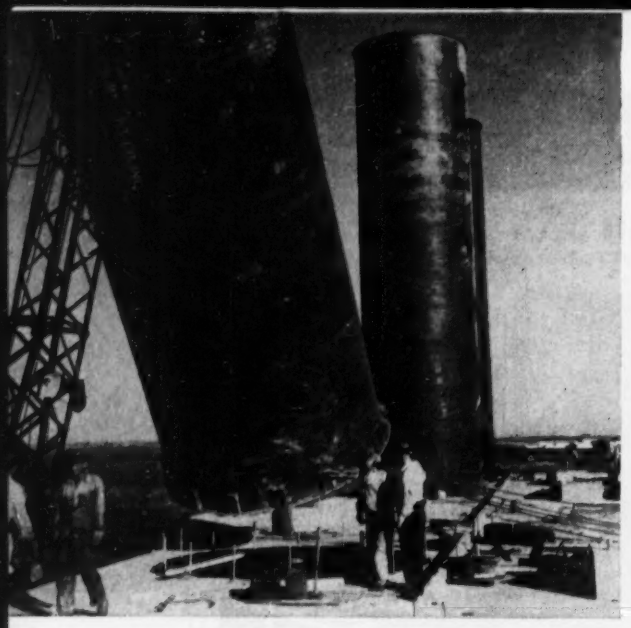
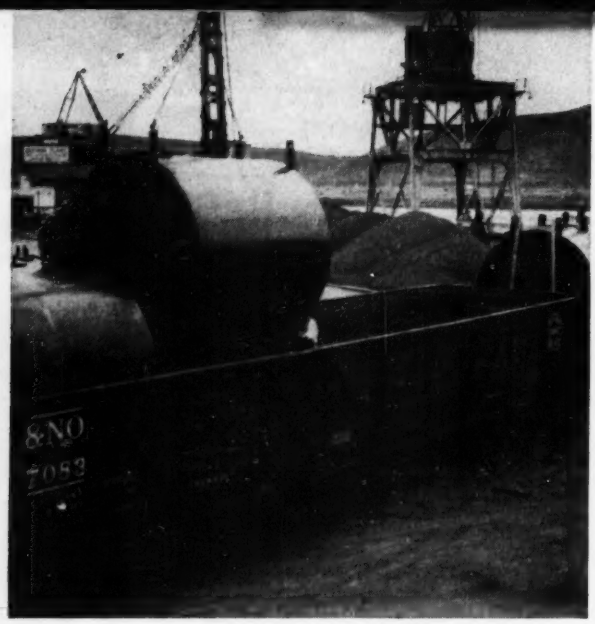
- ☐ Have you set up a list of volunteers so that efficient plans can be made for scheduling donors?

Remember, as long as a *single* pint of blood may mean the difference between life and death for *any* American . . . the need for blood is *urgent!*

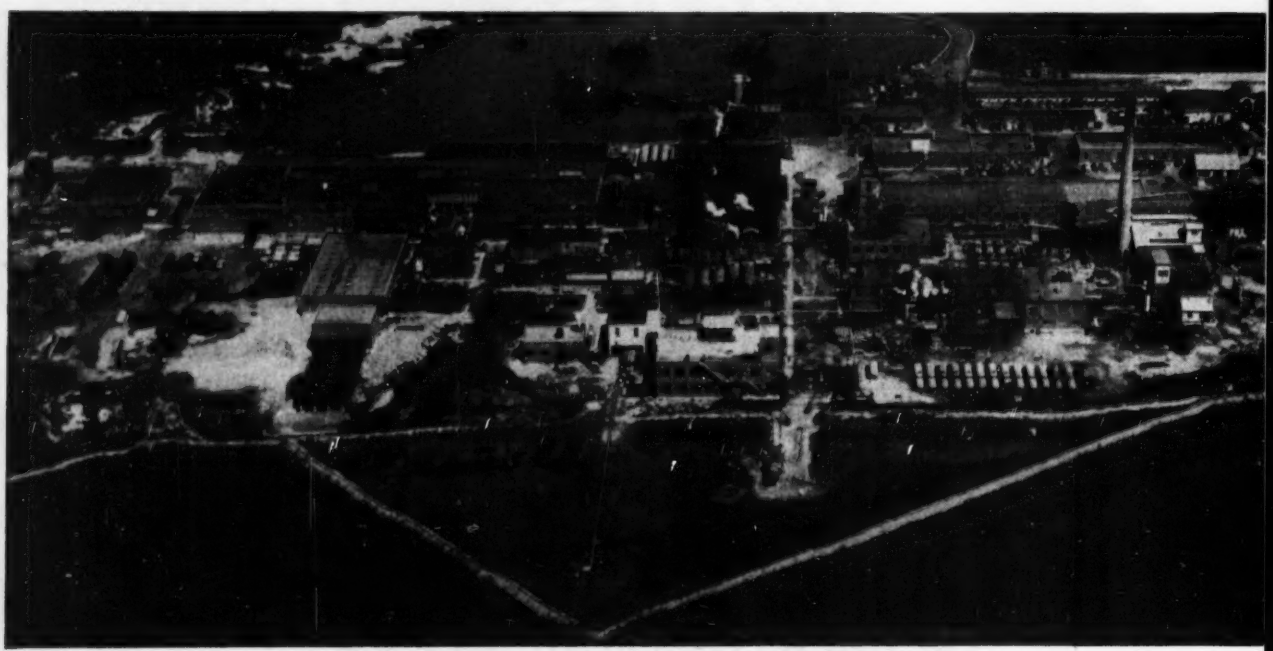


MISSISSIPPI MIRAGE – Rising like a ship above Garden Island Bay, La., Freeport Sulphur Co.'s new plant is taking shape fast – will push out 500,000 long tons of sulphur a year by 1954. Stacks are heat reclaimers for preheating the millions of gallons of water required for sulphur mining operations. With chemicals output slated for a 75% rise by 1960, CPI expansion is going full-blast. 1953 estimate for new plants and equipment – $6.3 billion.



'TWEEN-SIZE TANKS developed by West Coast chemical shippers solve tough packaging problem – fill the gap between 55 gal. drums and tank cars. In cubical shapes and cylinders, they range from 300 to 4000 gal. capacities – can be shipped by rail, truck or ocean transport. Packaging is big business when the CPI is your market – just-released study by CW market researchers shows $1.5 billion for containers and machinery

Mississippi mirage, 'tween-size tanks, sad shad,



SAD SHAD will perk up when New Jersey's Raritan River Valley gets its new $22.5 million sewer trunk. Water-tainting chemicals from plants like this drove the sea-going game fish from these spawning grounds but he'll be back when the long-sought waste disposal system is completed in 1956. It's more evidence of progress in joint efforts of process industries and municipalities to lick the waste problem. Of opportunities too – for equipment makers in the big $18 billion pollution control market.

ALERT MANAGEMENT looks to Robert A. Fulton (above right) when aerosol insecticides are the problem. He's head man when it comes to self-contained sprays at the U.S. Agriculture Dept.'s Research Center in Beltsville, Md. 32 million cans of aerosol buzz-bombs topped the list of pressurized products last year and this push button industry owes much of its success to Beltsville's research. "This business moves almost too fast to keep up with," Fulton says, "but CHEMICAL WEEK hasn't missed anything . . . it's complete, accurate . . . first rate all the way."

Management keeps informed in the Chemical Process Industries . . . on production, new packaging developments, pollution control . . . on all factors that affect planning in this big and integrated market. It's a lusty, news-making field spawning new products endlessly and spending more than $39 billion a year for new plant facilities, equipment and raw materials. And in this plan-ahead market, wise executives look to CHEMICAL WEEK for the clear understanding of facts so imperative to sound business judgment.

Complete, condensed and well-balanced, CHEMICAL WEEK penetrates every phase of the vast chemicals producing and consuming industries. From raw materials to sales . . . from plant sites to manpower . . . it provides a rapid interchange of ideas and news interpretations from the businessman's viewpoint. That's why CHEMICAL WEEK is an ideal way to take your product message to management . . . it brings you elbow-close to the men who mean business . . . in process *management's own* magazine.

alert management, and . . . Chemical Week

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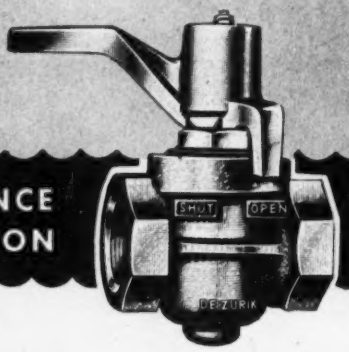
DeZURIK PLUG VALVES

TO MINIMIZE LEAKAGE AND MAINTENANCE
TO ELIMINATE LUBRICATION AND FRICTION



IN ALMOST EVERY VALVING SITUATION IN THE CHEMICAL AND PROCESS INDUSTRIES, DeZurik "Easy-Operating" Plug Valves are proving every day that they can INCREASE efficiency and DECREASE valve-trouble to an amazing degree.

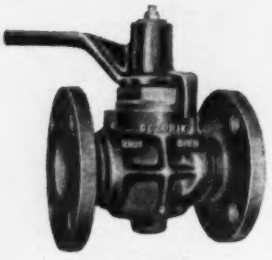
DeZurik Valves are *different* valves . . . featuring the exclusive eccentric plug which opens and closes with an easy quarter-turn, and operates in *any* service without forcing, sticking or clogging. There's no friction, no lubrication, no fussy adjustment.

TEFLON* OR RUBBER-FACED PLUGS

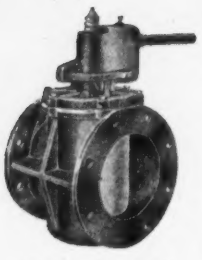
To provide for all types of flow including corrosive services, DeZurik plugs are now faced with TEFLON or with resilient rubber. These facings are bonded to metal plug-cores . . . They provide a cushioned, dead-tight closure . . . these plugs won't score, can't stretch or distort, resist gum-up and build-up. The eccentric-action makes them actually self-compensating for wear. (Plugs of all-metal structure are also available.)

FULL RANGE OF SIZES & METALS

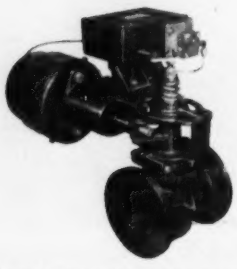
DeZurik Easy-Operating Valves are made in bodies of almost all metals and in rubber-lined models, in sizes from ½" to 20", one-way to four-way, for manual or remote operation.



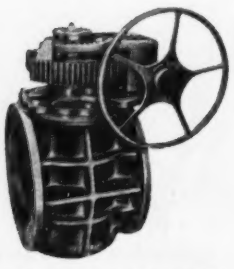
LEVER-OPERATED
Sizes ½" to 4"



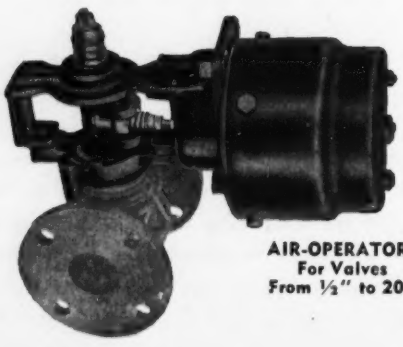
LEVER-OPERATED
Sizes 5" to 20"



AUTOMATIC CONTROL VALVES
Sizes ½" to 20"

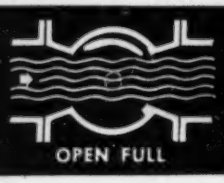


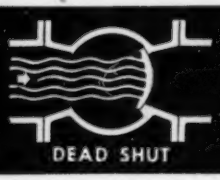
WORM-GEAR OPERATED
Sizes 4" to 20"



AIR-OPERATORS
For Valves
From ½" to 20"

* *TEFLON T.M. Reg. E. I. DuPont de Nemours & Co.*





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can help you solve processing problems— at a PROFIT

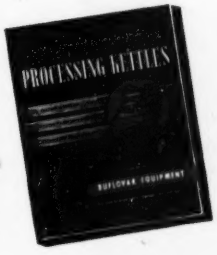
BUFLOVAK has helped another nationally-known manufacturer produce a better product at lower cost by combining two processes into one. That, of course, means greater profits!

A valuable, dilute, heat-sensitive solution is carried to high concentration in a single, compact unit. Ordinarily a two stage process would be required.

Special equipment was engineered for the job. A low-temperature, sanitary evaporator steamchest and a high vacuum processing kettle equipped with an agitator and selectable heating surfaces, were combined into a single, integral unit.

Through the combined facilities of our Research and Testing Laboratories, coupled with extensive field experience, BUFLOVAK Engineers design processing equipment for the most profitable results.

BUFLOVAK Catalogs have a wealth of valuable information on drying, evaporation and processing. A request on your company letterhead will bring copies to you.



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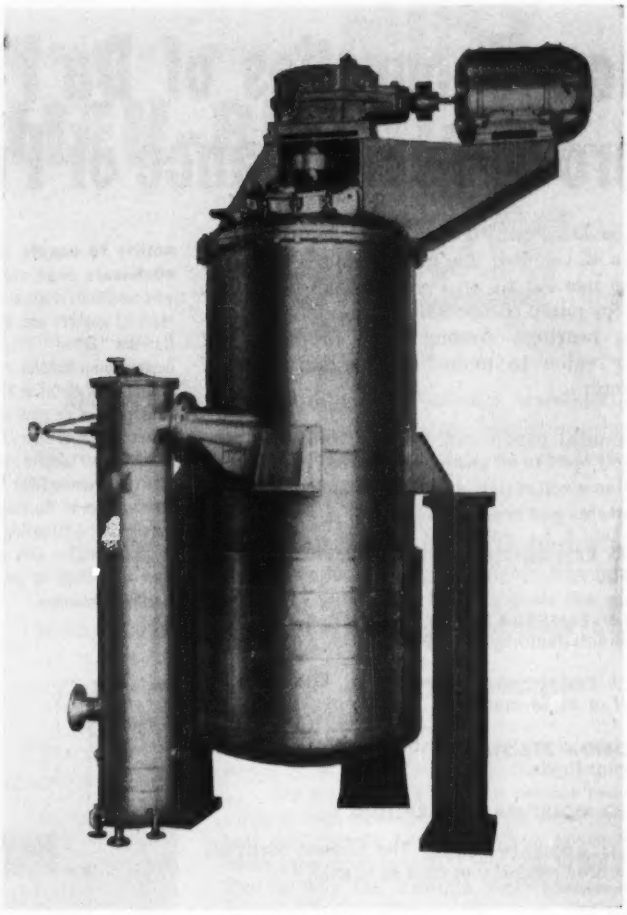

A special BUFLOVAK Evaporator-Still which combines two processes into one.

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To assist you in the solution of processing problems, BUFLOVAK offers the facilities of its Research and Testing Laboratory . . . where small scale experimental units show you, before you buy, the commercial possibilities, data on production costs, and characteristics of the finished product.

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DRYERS
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PROCESSING KETTLES
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Solvent Recovery & Distillation Equipment

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BLAW-KNOX COMPANY
BUFLOVAK EQUIPMENT DIVISION
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How Properties of Du Pont "Teflon"* Improve Performance of Pump Components

Ever since Du Pont "Teflon" tetrafluoroethylene resin was developed, its unique combination of properties has led to an ever-increasing use as a material for pump components—gaskets, packings, impellers, bearings. Among these properties—of particular value to manufacturers *and* users of pumps—are:

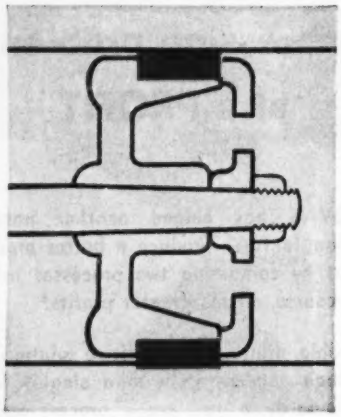
- **CHEMICAL INERTNESS.** Du Pont "Teflon" is completely inert to all chemicals and solvents, except molten alkali metals and fluorine at elevated temperatures and pressures.
- **HEAT RESISTANCE.** Capable of continuous service to 500°F.
- **LOW-TEMPERATURE TOUGHNESS.** Has been used satisfactorily to −320°F.
- **LOW COEFFICIENT OF FRICTION.** Either against itself or other materials.
- **EROSION RESISTANCE.** Resists erosion by impinging fluids.
- **ZERO MOISTURE ABSORPTION.**
- **NON-ADHESIVENESS.** The tackiest materials show little tendency to stick to "Teflon."

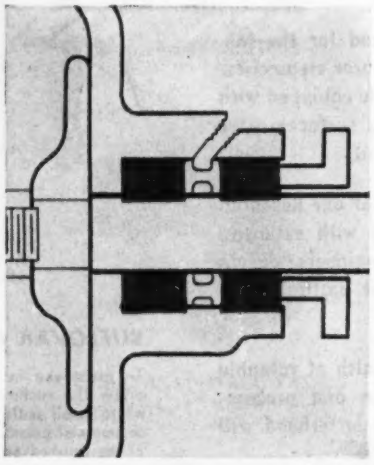
Illustrated opposite are some examples that show how pump components of Du Pont "Teflon" give outstanding performance and long service life . . . decrease production downtime . . . provide important savings in labor and material.

The Polychemicals Department of the Du Pont Company supplies "Teflon" in the forms of molding powders and aqueous dispersions. These forms are converted into various components for pumps, valves and other process equipment by a number of manufacturers. For further information, write: E. I. du Pont de Nemours & Co., (Inc.), Polychemicals Department, Room 251 Du Pont Bldg., Wilmington 98, Delaware.

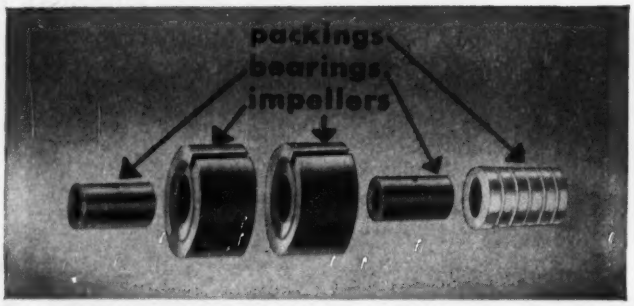
*REG. U. S. PAT. OFF.

Ability to handle corrosive chemicals under extremely severe conditions is one of the advantages of gaskets and packings of Du Pont "Teflon." This horizontal duplex pump handles a 50% concentration of NaOH at 270°F. The service life of its packings used to decrease steadily from 73 to 16 days as its cylinder became badly scored. After the cylinder was honed and packing rings of Du Pont "Teflon" were installed, these rings were still in good condition with no signs of wear on cylinder or packing after 5 months' operation.





Gains in productivity often outweigh the cost of replacing packing with Du Pont "Teflon." This centrifugal pump (having a 2-in. shaft operating at 3,500 rpm) would leak badly when pumping hot "butyl extract." With a packing of "Teflon," leakage was reduced considerably. The shaft sleeve used to need replacement every few days—now it stays in good condition over several months' operation.



EXCELLENT PERFORMANCE is assured with impellers and bearings of Du Pont "Teflon." When a positive-displacement pump is equipped with impellers, bearings and packings of "Teflon," the pump can usually handle a much wider range of chemicals. These impellers are strong enough to withstand high tangential loads. They won't gall, shrink, swell, crack or harden. The bearings need no lubrication and won't become pitted even when operated in acids. The packings, too, give long, trouble-free service.

Where bolted enclosures are a MUST...

Specify ALLEN-BRADLEY

because

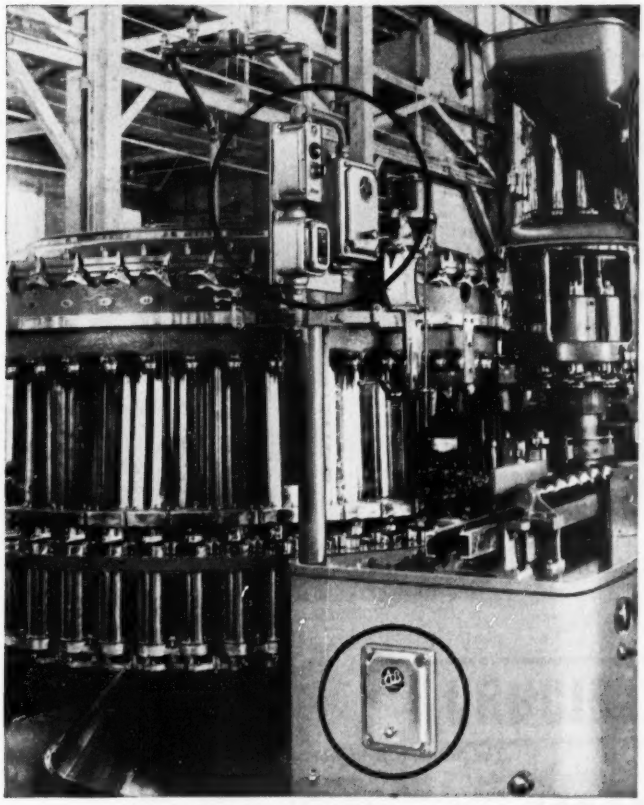
A-B Quality

The Sign of Quality in Motor Control

Allen-Bradley controls require no contact maintenance. The double break, silver alloy contacts never need filing, cleaning, or dressing. Nor is regular inspection necessary! The contacts are always in perfect operating condition.

Also, the simple solenoid design—only ONE moving part —is your reliable guarantee for millions of trouble free operations. When you eliminate moving or wearing parts like pins, pivots, linkages, and bearings, you automatically eliminate trouble.

. . . In moist or wet surroundings . . . time will prove that it's an economy to specify NEMA 4 Watertight Enclosures.



Dumore Bottle Filler operated with Allen-Bradley controls in NEMA 4 Watertight Enclosures.

Freedom from contact inspection and maintenance is, of course, desirable in any motor starter . . . but especially where the service requires enclosures with bolted covers. It is never easy to unbolt and handle heavy cast iron covers—even a minor amount of corrosion can add to the difficulty. That is why the average maintenance engineer favors Allen-Bradley trouble free controls. They know from experience that this entire line of starters, with their double break, silver alloy contacts, will operate for months . . . and even years . . . without requiring so much as contact inspection. They know also that the simplicity of Allen-Bradley starters means freedom from trouble . . . hence, your assurance of continuous operation. You win when you specify Allen-Bradley!

Allen-Bradley Co.
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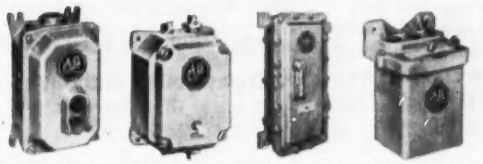
ALLEN-BRADLEY TYPICAL BOLTED SAFETY ENCLOSURES



Manual Starter NEMA 4 Enclosure | Automatic Starter NEMA 9 Enclosure | Combination Starter NEMA 7 Enclosure | Automatic Starter NEMA 11 Enclosure

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SOLENOID MOTOR CONTROL
QUALITY

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Chase Copper Tube keeps a clean, clear cross-section, even after years of service in a paper mill.

Get pipe that can't rust up inside. Chase Copper Water Tube keeps repair and pumping costs down.

PROCESS LINES give years of trouble-free service when you use Chase Copper Water Tube.

Chase Tube is corrosion-resistant, it can't clog with rust. Used for your process lines, it delivers full flow even for heavy industrial fluids like paper pulp. That means a big saving in pumping costs.

Chase Copper Water Tube installed with Chase Wrought Solder-Joint Fittings makes an assembly that has very low flow resistance. It will pay you to find out about Chase Copper Water Tube.

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When selecting stainless steel be sure you pick the correc type for your particular application. For some grade resist corrosion better . . . others have superior heat resi tant properties. Some are easier to machine . . . still other can be more readily formed or welded.

In every case there is a grade of Crucible REZISTA Stainless Steel that is best suited to the job. And to hel our customers select the type that will provide the be service for the lowest cost, we make available all the desig metallurgical, fabricating and application data we hav accumulated in our years of stainless steel experience wit many different industries.

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Write for free copy of "Making the most of Stainless Steels in the Chemical Process Industries".

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LARGEST...

Most Modern Light Aggregate Plant

USES VULCAN ROTARY KILNS

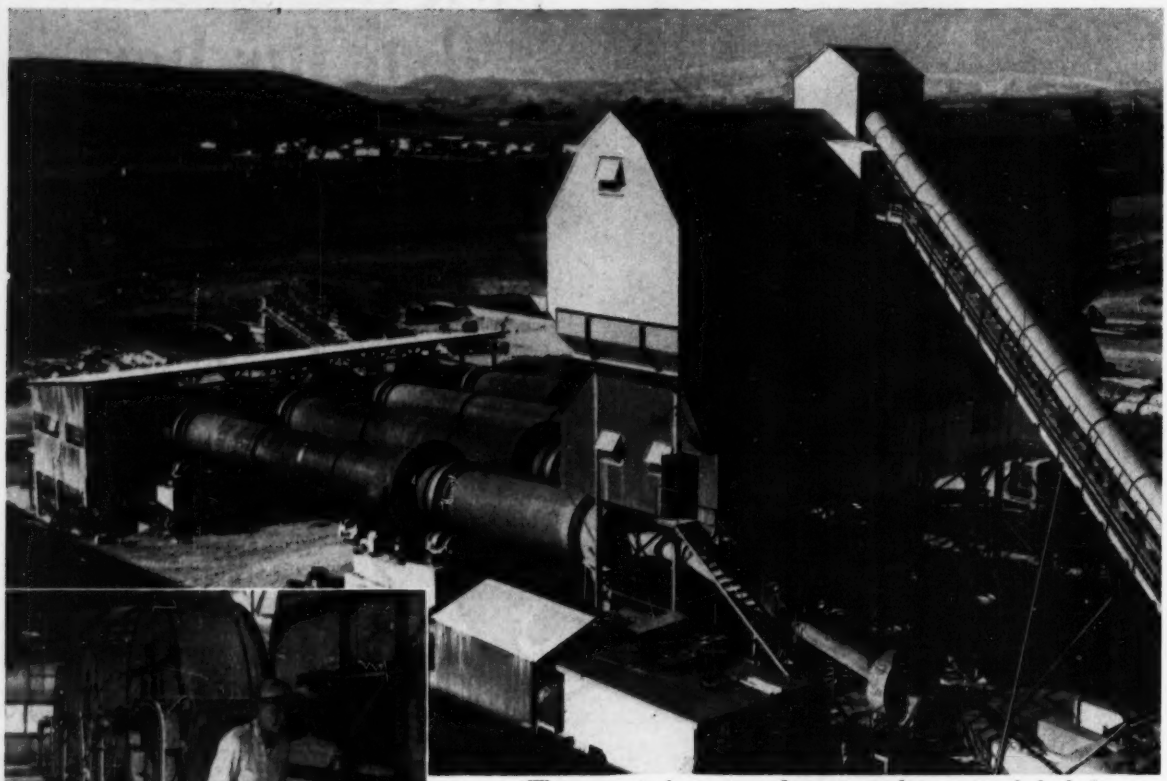

Illustration above shows the four firing hoods which are adapted for both gas and oil.

Any information on items listed below will be sent to you immediately:

- Rotary Kilns, Coolers and Dryers
- Rotary Retorts, Calciners, Etc.
- Improved Vertical Lime Kilns
- Automatic Quick-Lime Hydrators
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The newest, largest, and most modern expanded shale lightweight aggregate plant west of the Rockies is shown above. It is one of the fifteen plants operated by The Basalt Rock Co., Inc., of Napa, California. This new plant is now in full operation and is producing "New Basalite" at the rate of 700 cubic yards daily.

This plant, which is the last word in design and efficiency includes four VULCAN 8′ x 125′ all-welded Rotary Kilns. Each kiln has two tires, and is driven by a 20 hp varidrive motor with a standby diesel-driven generator, in case of power failure. The four VULCAN Kilns are gas fired, and in case of an emergency are also adapted for use with oil.

Each and every part of all VULCAN Kilns are precision designed, precision built to give you maximum protection against mechanical troubles of all kinds. The VULCAN IRON WORKS of WILKES-BARRE, and its 105 years of experience are ready and willing to give you information on Rotary Kilns for any application. Write for detailed and fully illustrated Bulletin No. A-442 today.

VULCAN IRON WORKS

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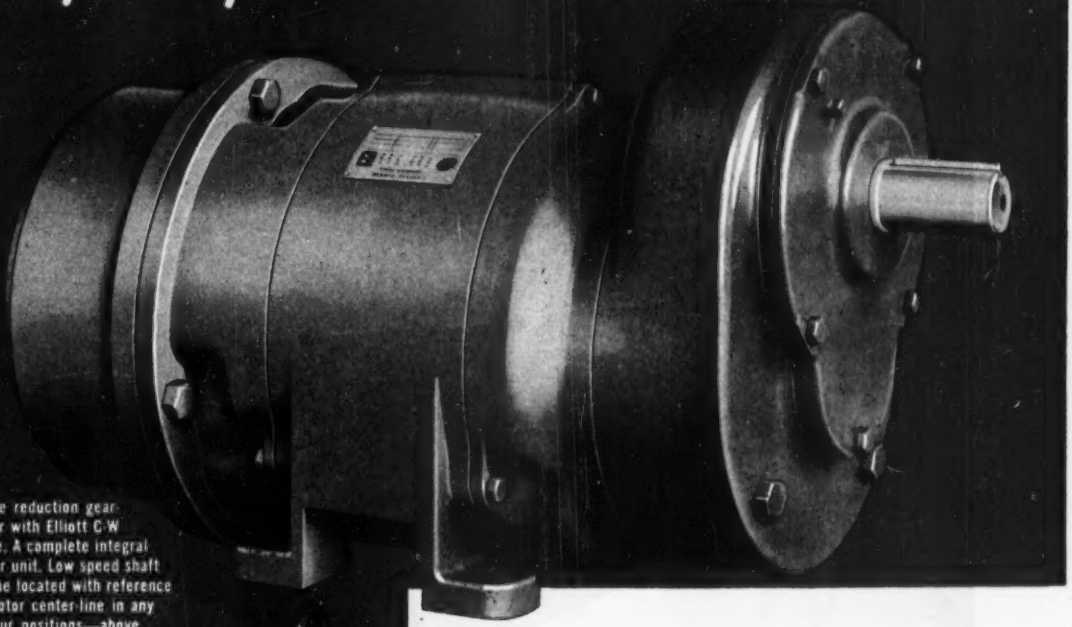
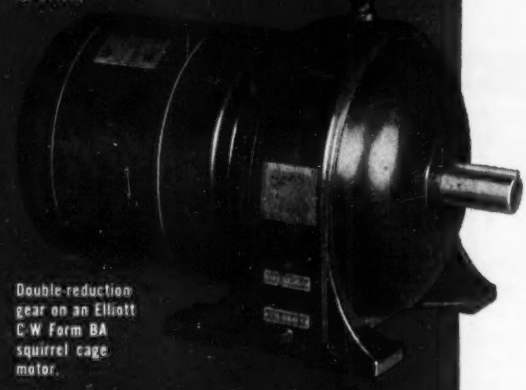
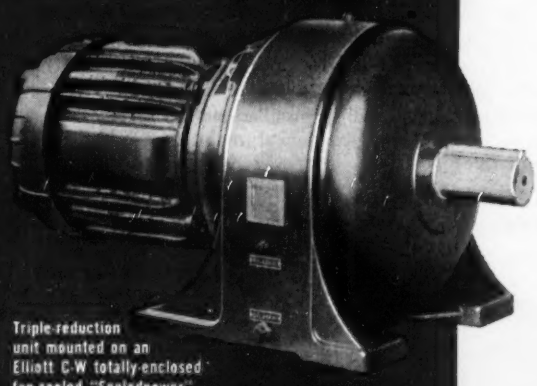
The speed you want...where you want it!



Single reduction gear-motor with Elliott C-W brake. A complete integral power unit. Low speed shaft can be located with reference to motor center-line in any of four positions—above, (as shown) at right, left, or below.



Double-reduction gear on an Elliott C-W Form BA squirrel cage motor.



Triple-reduction unit mounted on an Elliott C-W totally-enclosed fan-cooled "Sealedpower" explosion-proof motor.

W3-10

ELLIOTT
CROCKER-WHEELER
Gearmotors

Here is a complete line of motors with built-in reduction gear units which covers practically every need.

Available in any motor type, any enclosure, any mounting, in frame sizes from 1 to 150 hp.

Single reduction, 780 to 280 rpm... double reduction, 230 to 45 rpm... triple reduction, 37 to 7.5 rpm.

Construction features include precision processed, file-hard gears, large oil reservoir for abundant splash lubrication, heavy, rigid cast iron pyramidal base, and a bearing housing and oil seal *separating* the inner high speed motor bearing from the gear lubrication, which after much service may contain minute metallic particles tending to shorten bearing life.

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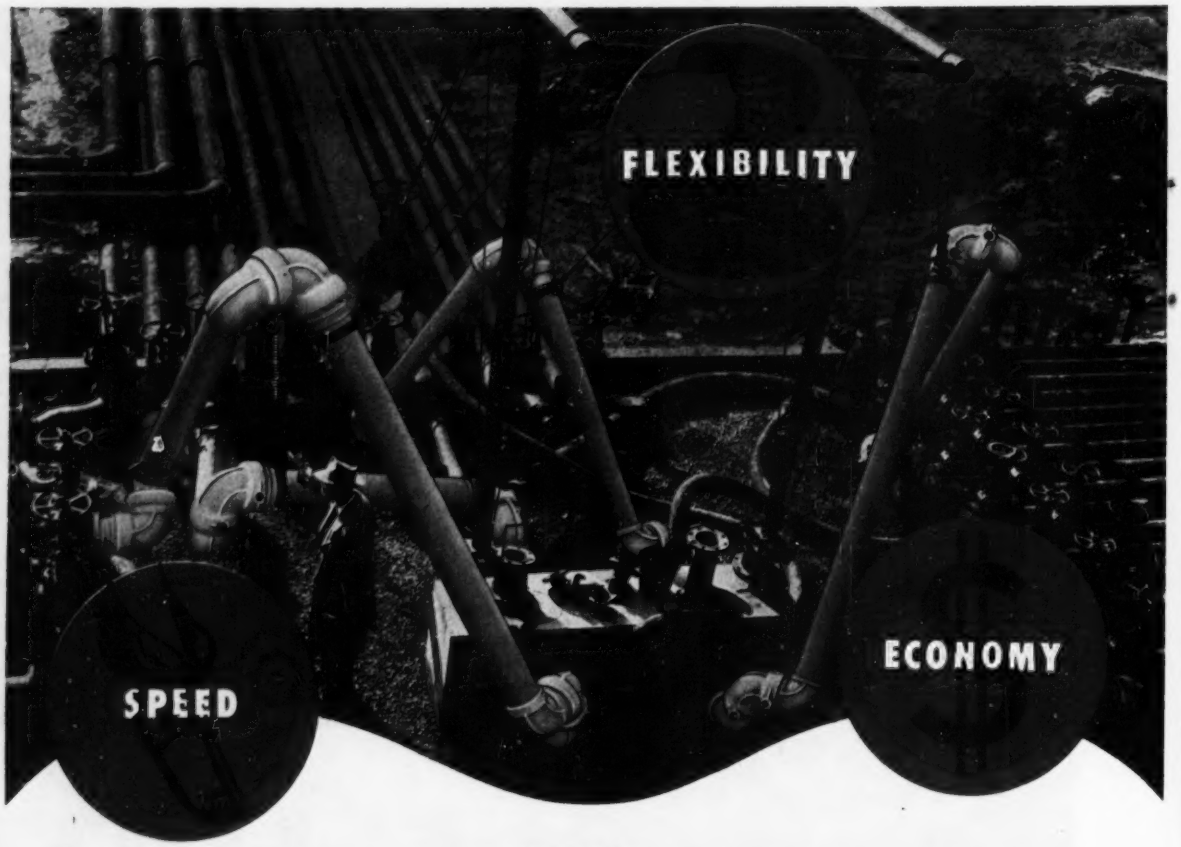
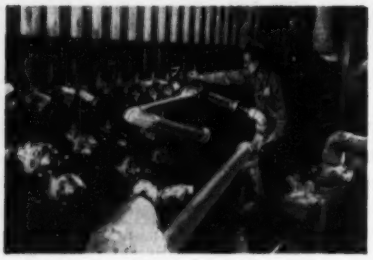
ELLIOTT Company
CROCKER-WHEELER DIVISION



CHIKSAN Swivel Joints illustrated in this installation, facilitate the speedy, economical handling of various fluids through 16 lines from loading dock to manifolding pit — a distance of 800 feet. Since each line leads to a separate tank through the manifold, cross contamination is eliminated.



CHIKSAN Swivel Joints in the pump manifold above enable operator to pull base stock from outside storage into the plant and direct flow to proper vessel or proportioner.

The Flow of Enterprise Relies on

CHIKSAN

Ball-Bearing Swivel Joints

CHIKSAN Manifolding Saves 3 Ways!

- √ ORIGINAL INSTALLATION
- √ NO CONTAMINATION LOSSES
- √ LOW COST OPERATION

Original cost of CHIKSAN flexible line manifolding installations often run as much as 50% less than fixed line manifolding operations which incorporate costly multiple valve and line systems.

A CHIKSAN manifolding operation is simplified in its entirety — providing complete flexibility, mobility and ease of operation in limited spaces.

CHIKSAN manifolding installations reduce line hook-up time — keep pit floor clear of lines thereby providing greater working areas.

CHIKSAN manifolding operations facilitate the transfer of all types of fluids safely and rapidly under extreme climatic conditions with no possibility of cross contamination.

CHIKSAN manifolding installations are specifically engineered for long life — easy and economical maintenance, and render years of trouble-free operation.

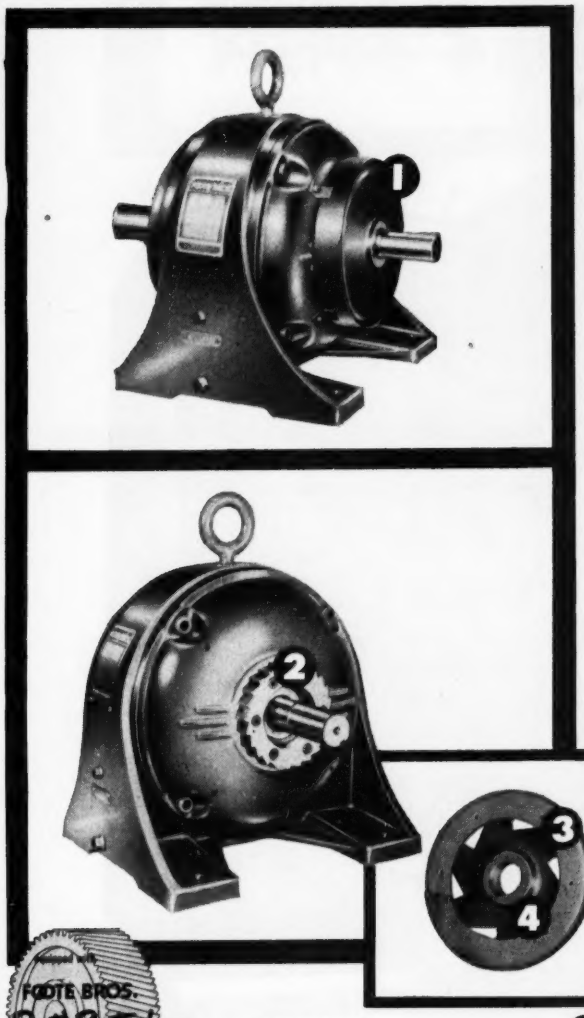
Our Engineering Research and Development Department will welcome inquiries on your manifolding problems.

Write for Catalog 53-C, Dept. CE-1

CHIKSAN

NOW ...built-in protection against reversing!

...NEW FOOTE BROS. BACKSTOP for LINE-O-POWER!



NOW . . . Positive prevention of reverse rotation! Famous straight line Line-O-Power Drives now offered with the new, built-in Foote Bros. Backstop as optional equipment!

Sturdy, compact, symmetrical — this Backstop automatically stops shaft reversal. During forward motion, operation is without contact — *noiseless and wear-free.* Because of advanced design, you can order it without regard to application or service factors . . . and you can change it in the field, in minutes, for opposite rotation. For Line-O-Powers now in service, the mechanism is quickly installed at the Foote Bros. Plant.

Here's why you get more with LINE-O-POWER Drives

Economical to buy, economical to run. Ruggedly designed for toughest jobs. Engineered around Duti-Rated Lifetime Gearing with file-hard teeth and tough, resilient cores. Higher efficiency, greater capacity and longer life — in minimum space.

In straight line design, low-cost Line-O-Power Drives are foot mounted for floor, wall or ceiling applications. Ratios range up to 238 to 1, capacities up to 178 h.p.

For right angle applications — horizontal or vertical — choose the worm-helical gear Line-O-Power, foot or flange mounted. Flange-mounted units available with standard output shaft or with an extended low-speed bearing housing for maximum over-hung load support. With ratios ranging up to 2,726 to 1, Right Angle Line-O-Power Drives are ideal for slow speed jobs.

Call your Foote Bros. representative, or write for helpful information.

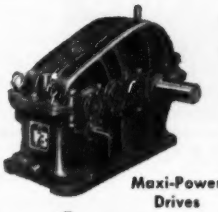
FOOTE BROS. Duti-Rated LIFETIME GEARING

This Trademark Stands for the Finest in Industrial Gearing

1. **Sturdy Guard — Shields moving parts.**
2. **Machined-steel Ratchet Plate — Securely bolted to Line-O-Power housing, but easily reversed for change in direction of rotation.**
3. **Cast Backstop Housing — Rigidly keyed to input shaft.**
4. **Hardened Ratchet Pawls — Lock against ratchet plate under spring pressure to prevent counter-rotation.**

Foote Bros.-Louis Allis Gearmotors

Hygrade Drives



Maxi-Power Drives

FOOTE BROS.

Better Power Transmission Through Better Gears

FOOTE BROS. GEAR AND MACHINE CORPORATION
Dept. CE 4545 South Western Boulevard, Chicago 9, Illinois

Please send me information on:

- ☐ Straight Line-O-Power Drives.
- ☐ New Foote Bros. Backstop.
- ☐ Right Angle Line-O-Power Drives.

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Company.....

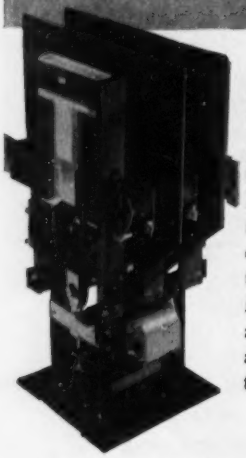
Address.....

City..... Zone..... State.....

which contactor meets your needs

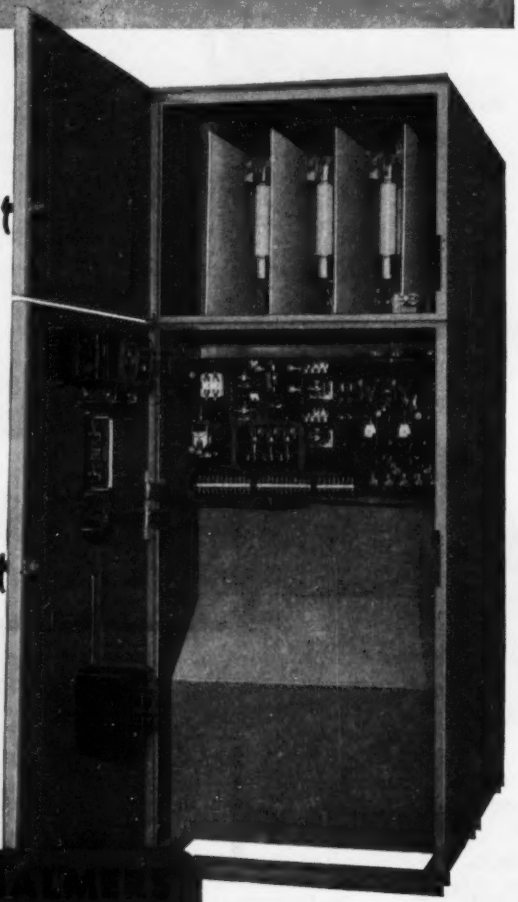
AIR or OIL?

Either may be built into your Allis-Chalmers Type H starter along with meters, overload relays, current limiting fuses, auxiliary switches . . . the coordinated components dictated by your application for complete protection of man, motor and machine.



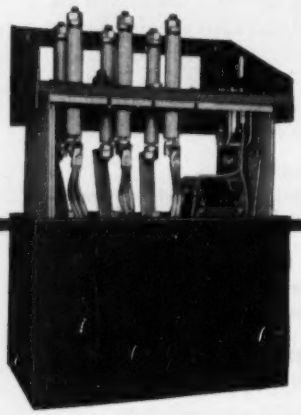
AIR-BREAK CONTACTOR

When the going's rough . . . that's the place for the Type 256 air-break contactor. Frequent starting, inching, reversing or dynamic braking are taken in stride by this rugged performer. And, of course, fire hazard is greatly reduced. No turning shafts, shaft bearings and flexible leads to cause maintenance headaches. Double-break contacts, vertical action and dual blowouts provide long, trouble-free operation.



OIL-IMMERSED CONTACTOR

Got atmospheric troubles? The Type MO oil-immersed contactor will perform heavy duty starting service in dust-laden, corrosive and very moist atmospheres. Contactor is of the time-proved clapper type. Self-cleaning, rolling-wiping action extends contact life. Make and break arcing occurs only on tips. Self-aligning E type magnet provides perfect armature seating . . . long, quiet operation. Permanent windlass tank-lifter simplifies maintenance. A-4103



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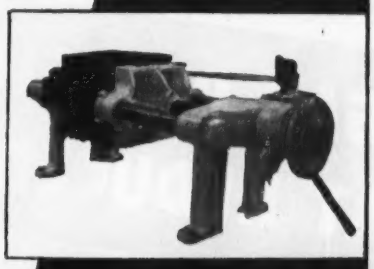

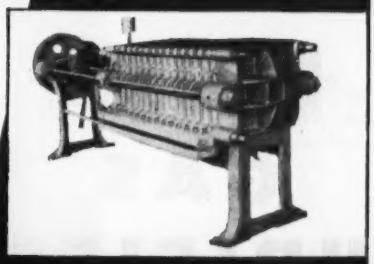

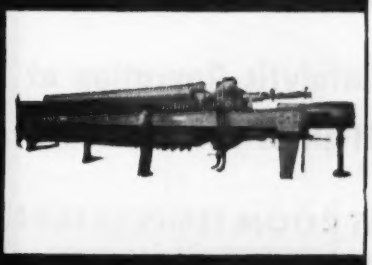

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AVAILABLE CAPACITIES: 25 CFH to 500,000 CFH

NO MAINTENANCE COST
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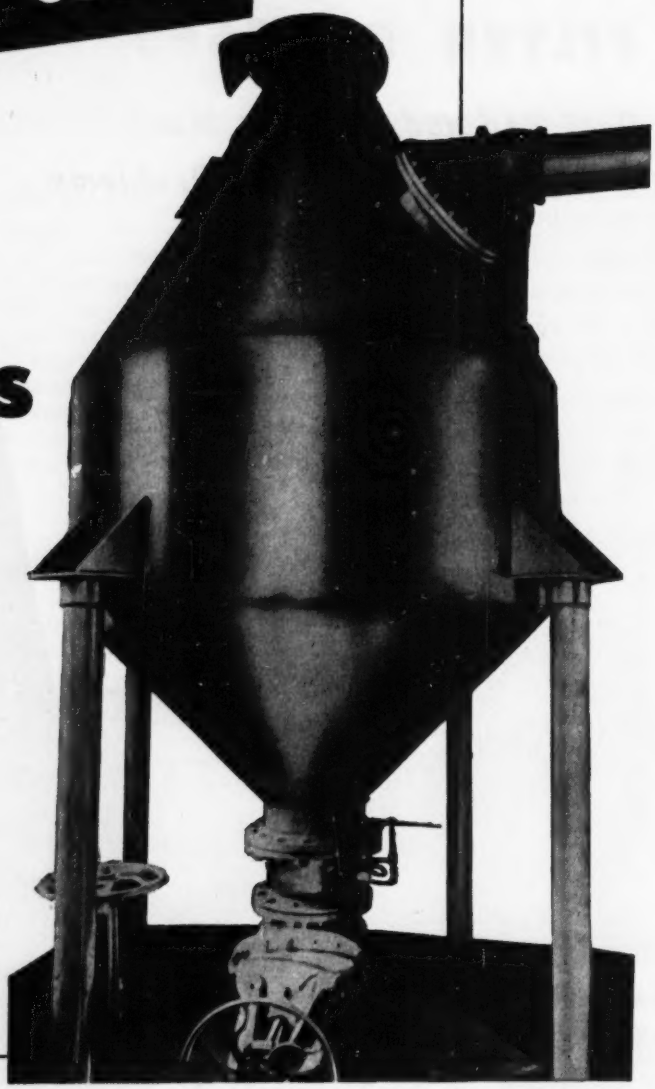

Typical installation in Chemical Plant—150,000 CFH Deoxo Purifier.

BAKER & CO., INC.

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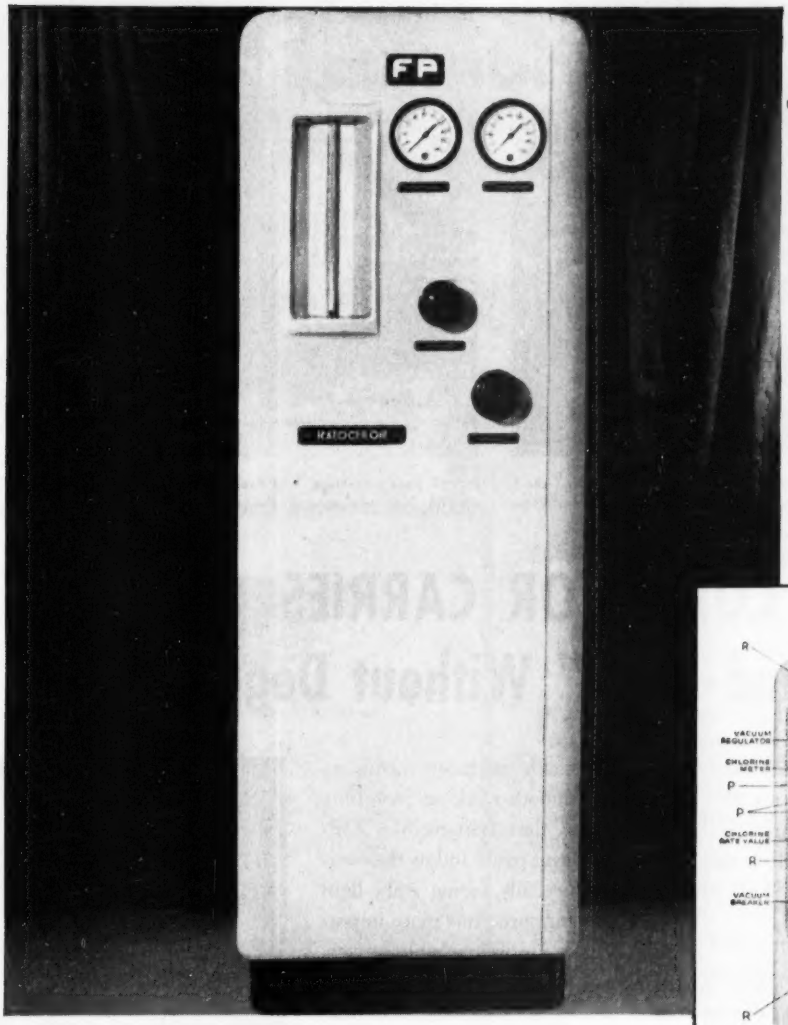
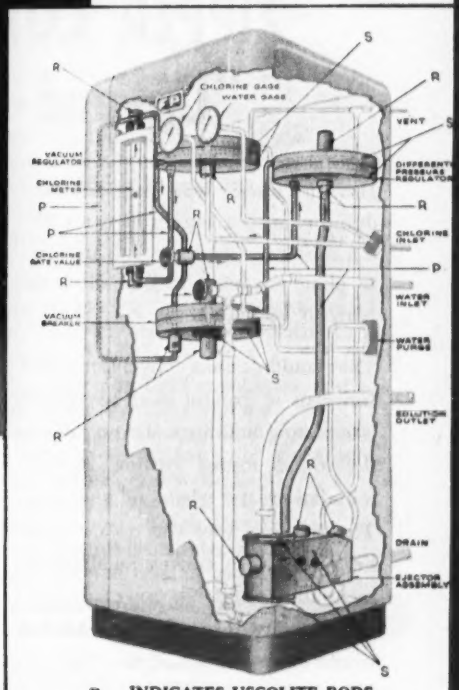
Unusual resistance to chlorine makes Uscolite® a "must" for this chlorinator



(Below) View of U.S. Uscolite Fittings in chlorinator. They are also used on machined flanges and connectors.



R INDICATES USCOLITE RODS
P INDICATES USCOLITE PIPING
S INDICATES USCOLITE SHEET

To handle chlorine, especially moist chlorine, requires the finest corrosion-resistant material, since this gas is more difficult to handle than hydrochloric acid. The manufacturer of this chlorinator, Fischer & Porter of Hatboro, Penna., in its search for the right material, selected U. S. Uscolite, after more than a year of testing *in their own* laboratories and in the field.

Uscolite is a thermoplastic made by United States Rubber Company. It is highly resistant to most chemicals, is extremely light, with great impact strength. Month by month, more and more manufacturers are finding that it gives them advantages unobtainable in any other material. Uscolite is an example of how "U. S." research scientists can invariably come up with a solution to a "they-said-it-couldn't-be-done" problem. Call any of our 25 District Sales Offices, or write to address below.

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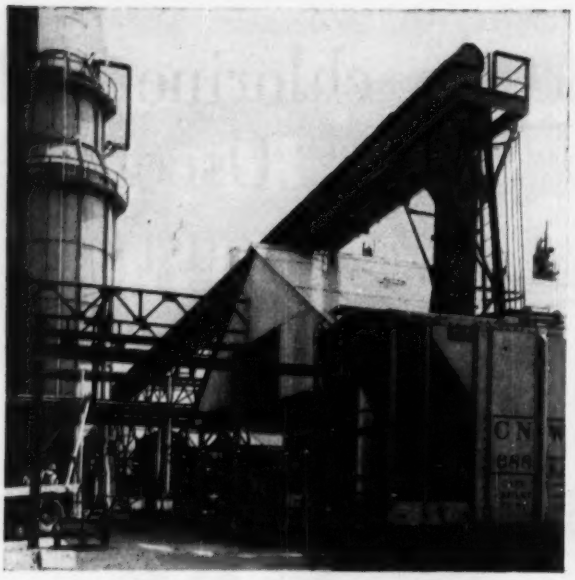
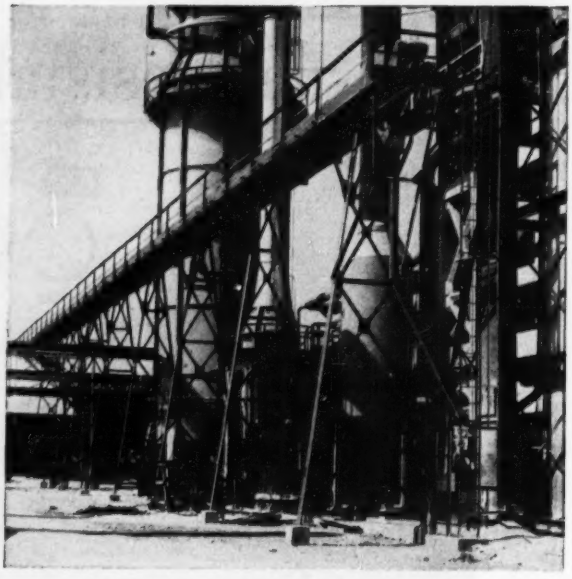


Hopper bottom car discharges to ZIPPER in shallow tunnel. After short, horizontal run, the ZIPPER rises vertically to 35' to clear buildings.



ZIPPER runs overhead 250 feet to discharge point. With a belt speed of 106 feet per minute, the conveyor can handle 10 tons per hour.

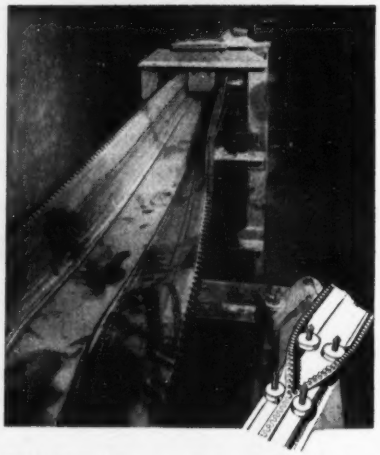
ZIPPER CONVEYOR CARRIES CATALYST "Up-and-Over" Without Degradation

How to move bead catalyst from dump cars to a bucket elevator lifting to storage gave a tough problem to plant engineers at this Oil Company in Louisiana.

They couldn't use a conventional belt conveyor at ground level because of intervening buildings. To tunnel underground meant cutting through foundations and relocating pipe lines. The simplest way was to go overhead. But with conventional equipment this meant big power requirements and excessive degradation that would destroy much of the effectiveness of the catalyst.

The company's engineers came up with a smooth-working solution. They found that a single S-A ZIPPER Conveyor could follow the overhead route easily, using only light structural supports. But more important, because this remarkable conveyor *zips shut* after loading, it forms a snug, moving tube in which the bead catalyst cannot shift. *Degradation is practically non-existent*—and a 5 HP motor with Saco Speed Reducer provides all the power needed.

If you have a bulk materials handling problem that seems hard to solve, why not let our engineers look it over? Write us for a free survey.



Open Zipper Conveyor Belt rounds tail pulley and moves to loading point. Side walls then zip shut to form a snug fitting tube around the material.

SINCE 1901 S-A STEPHENS-ADAMSON MFG. CO.

STEPHENS-ADAMSON MFG. CO.

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Engineering Division
Specialists in the design and manufacture of all types of bulk materials conveying systems.

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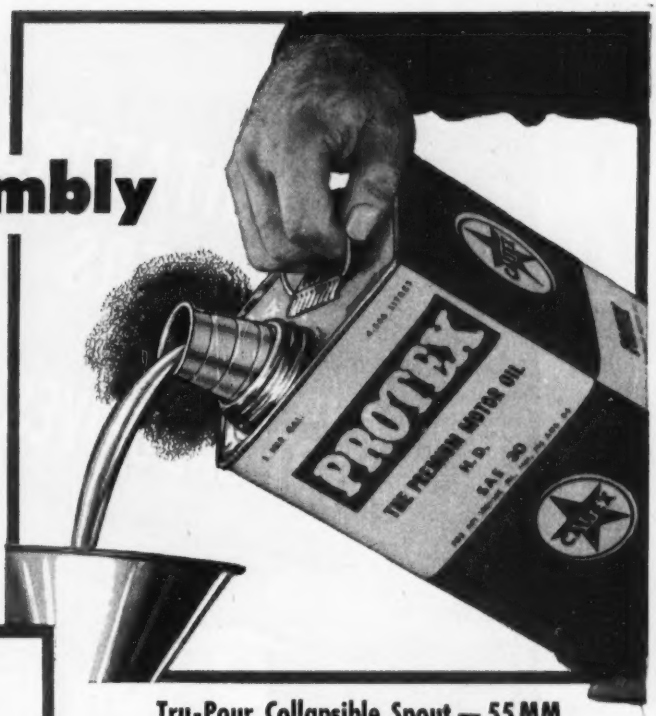
A complete line of conveyor accessories including centrifugal loaders — car pullers — bin level controls—etc.

SealMaster Division
A complete line of industrial ball bearing units available in both standard and special housings.

Tri-Sure®
Tru-Pour Assembly
makes packing and pouring
easy

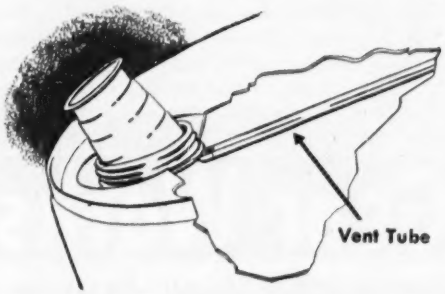


Tru-Pour Collapsible Spout — 55 MM Nozzle Assembly for Upressit Cap
Filling opening, 1¼"; pouring opening, 1⅜".

Screw Cap
Available plain or lithographed, complete with liner.

Inner Seal

Tru-Pour Collapsible Spout — 2¼" Screw Nozzle Assembly
With or without base to accept vent tube.
Filling opening, 1¼"; pouring opening, 1⅜".



The Tri-Sure* Tru-Pour Assembly provides a leak-proof closure that protects your product in transit and greatly facilitates handling, pouring and packing.

This closure features a collapsible spout which can be quickly extended to direct the flow into an opening, and instantly folded so that pails can be easily stacked. Assembled with a 2¼" screw nozzle or a 55 MM nozzle for Upressit Cap, for containers of 1 to 12 gallon capacity.

If you ship liquid products in light containers, the Tri-Sure Tru-Pour Assembly offers you an opportunity to improve your packaging and increase the good-will of your customers. Ask your container supplier now for full details, and write to us for illustrated literature on the complete line of Tri-Sure Container Closures—Screw Caps, Nozzles, Spouts and Assemblies that meet every requirement for security and ease of handling.

Tri-Sure Container Closures comply with I.C.C. and C.R.C. specifications.

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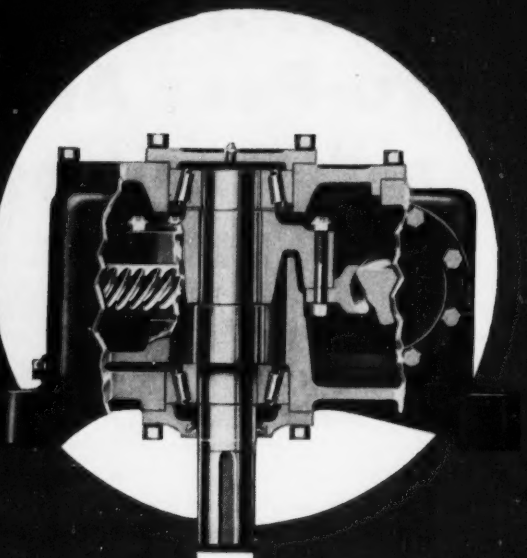
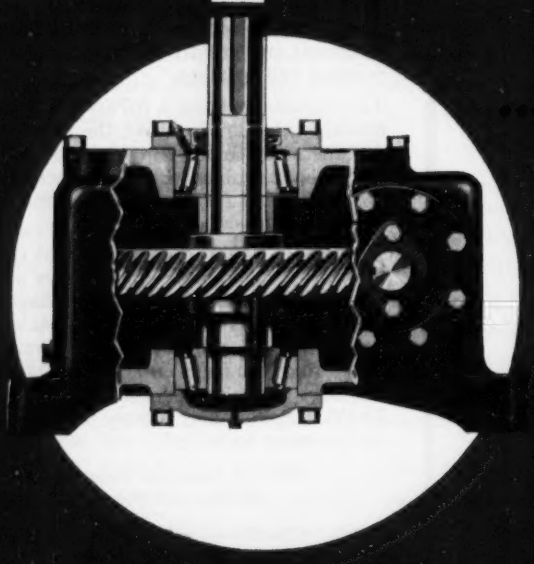


SHAFT UP OR SHAFT DOWN



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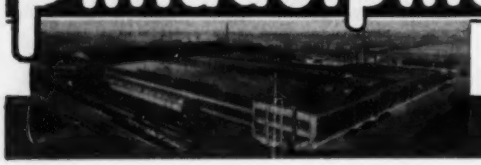
Matching high quality with distinctive design, these Philadelphia units offer a combination of construction features not found in any other worm gear reducer. Indicative of these unusual advantages is the famous "dry well" construction of the shaft-downward type. This feature completely eliminates the necessity of depending on a stuffing box or oil seal to prevent oil dripping down the shaft.

Send for our 88 page *Worm Reducer Catalog* . . . it gives complete descriptive, ordering and installation data.

Philadelphia Gear Works, INC.



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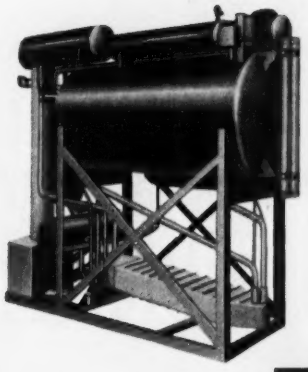
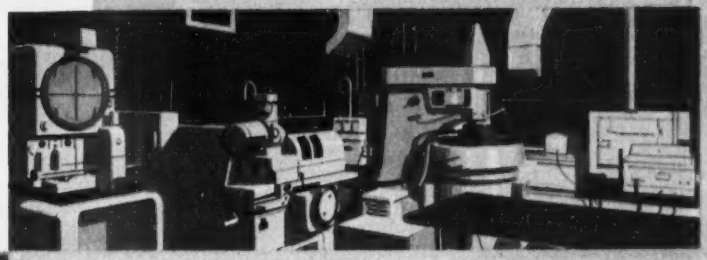
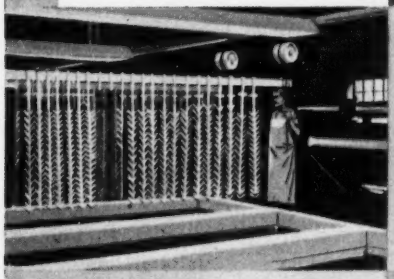
use WASTE HEAT to control HUMIDITY and TEMPERATURE



Servel 25-ton Water Chiller
No moving parts. Operates continuously at peak load with minimum maintenance on steam from any source.





Industrial Precooling
Use Servel Water Chillers to precool air and increase capacity and improve performance of compressors and internal combustion machines. Opportunities for varied and profitable use are practically unlimited!

Process Cooling
Continuous high efficiency and dependability makes Servel Water Chiller ideal for process cooling. Temperatures of liquids can be closely regulated and held to precision limits in manufacturing and formulating processes.

Air Conditioning
Here's economical temperature and humidity control. Water is used for refrigerant. No compressors! Units may be placed for efficient zone control. Frequently, costly duct work can be completely replaced by simple piping arrangements.

The Servel absorption principle lets you use waste heat (or steam, from any source) to chill water for air conditioning or other cooling needs.

The flexibility and operating efficiency of the Servel Water Chiller is unmatched. *No moving parts design* means quiet, vibration-free operation, low upkeep. Capacity can be reduced by 50% with corresponding power savings. Compact size and low floor loading permit single or multiple installations in most advantageous locations.

Your investment is protected by a full five-year factory warranty!

Check these advantages against *your* cooling requirements. Your Servel dealer will supply details and engineering assistance, or mail coupon today!

Send coupon for details!

Servel

the name to watch for great advances in
AIR CONDITIONING ✓ REFRIGERATION

SERVEL, INC., DEPT. CE14, Evansville 20, Indiana

Send me specifications and full information on Servel Water Chillers.

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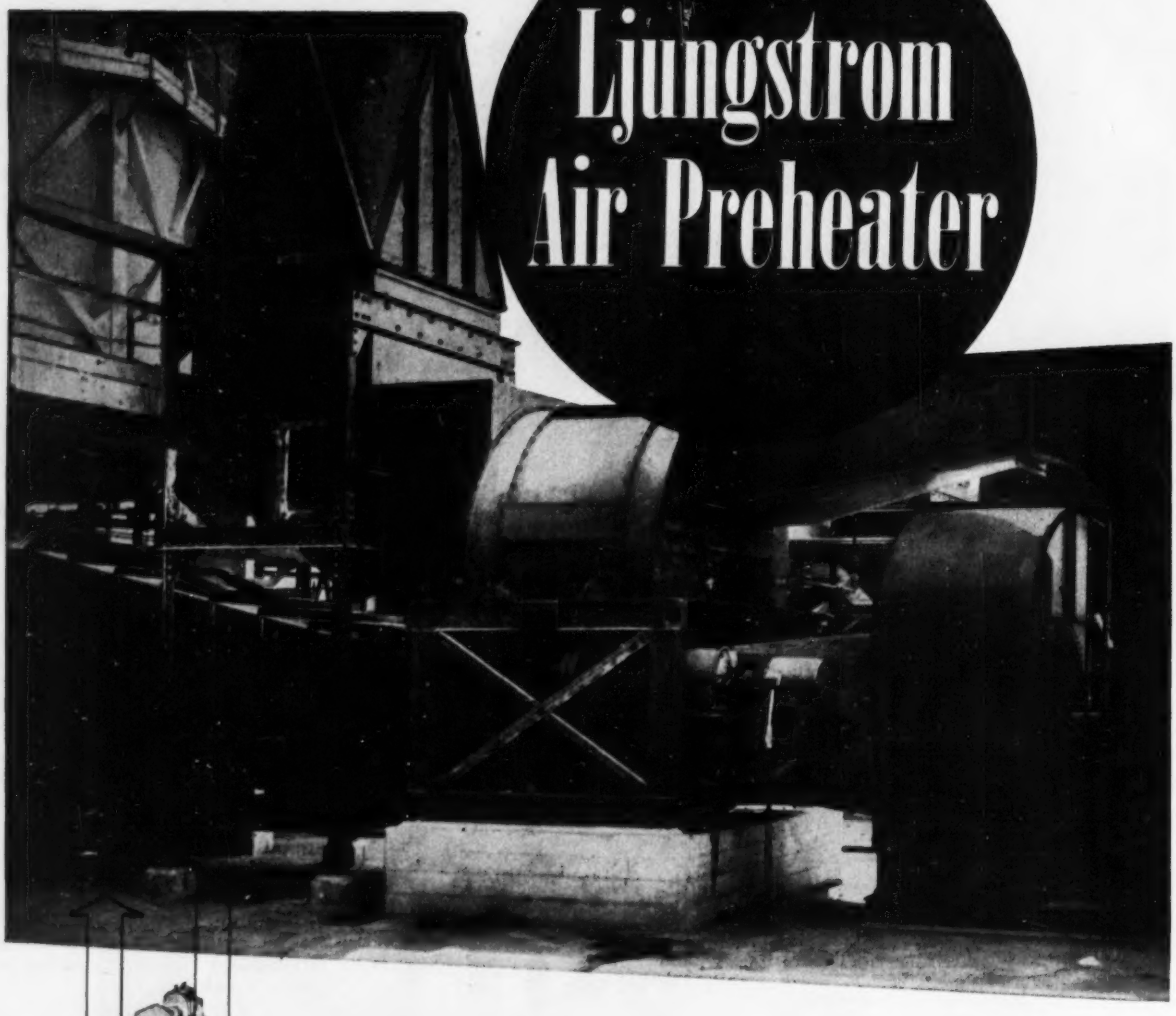
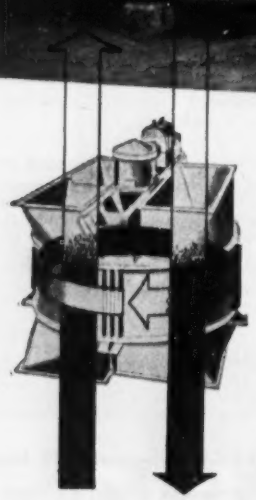
Get Higher Throughput

Ljungstrom Air Preheater





The Ljungstrom operates on the continuous regenerative counter-flow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves, the heat is transferred from the waste gases to the incoming cold air.

With the process industries' production at all-time high levels – and climbing higher – here is a timely suggestion that may point the way to significant production increases in your plant – *without adding a single still.*

A Ljungstrom Air Preheater, properly combined with modern draft and burner equipment, can increase still production as much as 25%. At the same time, plugging is so much reduced that production lost to downtime will be astonishingly low.

The value of the Ljungstrom Air Preheater lies in its ability to recover heat normally lost up the stack, and to return a large portion of it to the furnace zone in the form of preheated combustion air. Fuel requirements are drastically reduced and–where furnace capacity permits – throughput goes up considerably.

Furthermore – the finer temperature control possible leads to closer control of the end product. This alone can mean tens of thousands of dollars a year.

Wherever you are replacing, modernizing, or adding new equipment that burns fuel – consider the economies you can get with a Ljungstrom. Call or write The Air Preheater Corporation for complete information.

Wherever You Burn Fuel, You Need Ljungstrom

THE AIR PREHEATER CORPORATION 60 East 42nd Street, New York 17, N. Y.

Why ALDRICH PUMPS Reduce Maintenance Cost

ALDRICH

Write for catalogs, engineering service or a representative's call. We invite your inquiries.

Design simplicity . . . rugged construction

Aldrich Pumps are built to take punishing service year after year. You can find Aldrich Pumps, today, in good running order after 30, 40 and even 50 years of service. Durability such as this is the result of Aldrich's design simplicity and rugged construction.

Accessibility . . . sectionalization

When wearing parts are due for replacement, in Aldrich Pumps they can be replaced easily, quickly and at low cost. For instance, manifolds can be moved out on the holding studs and you can lift out and replace valves as complete units. . . . Stuffing boxes are particularly accessible—making it easy to renew packing. . . . To meet a change in pressure or capacity requirements, plunger sizes can be changed — in most cases merely by using new glands, throat bushings and packing in the same fluid-end. . . . Wearing parts are interchangeable among pumps of the same stroke size. . . . Fluid-ends are sectionalized to make possible low cost parts replacement and can be made of stainless steel, bronze, Monel or other material.

TYPICAL CHEM APPLICATIONS FOR ALDRICH PUMPS:

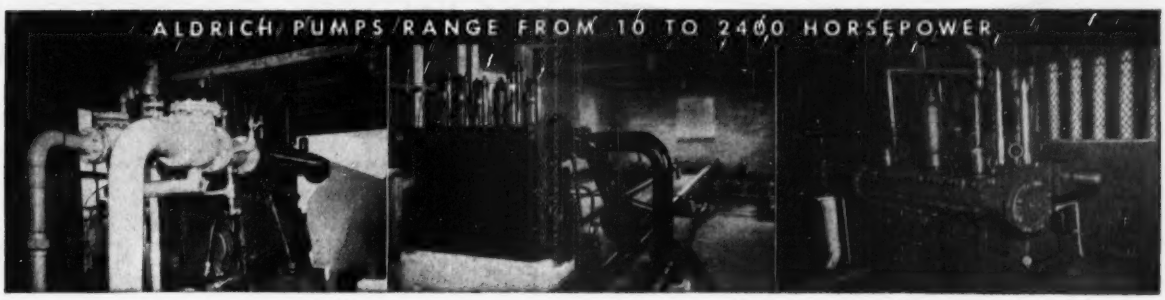
caustic solutions	fatty acids
anhydrous ammonia	nitric acid
amine solution	cobalt solutions
pulp density mineral ore	acetic acid
aqua ammonia	gritty water
slurry nickel catalyst	urea

. . . as well as liquids encountered in petroleum refining, petrochemical and other industries . . . corrosive liquids, high viscosity, and/or high pressure applications.

Representatives in Principal Cities

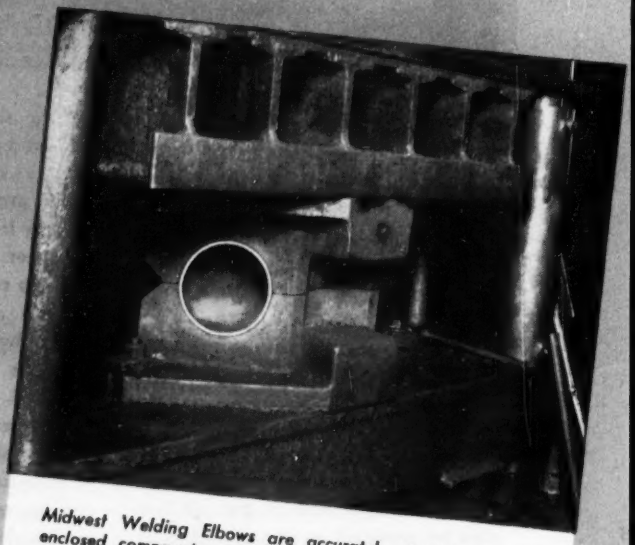
The Aldrich Pump Company

3 Gordon Street • Allentown • Pennsylvania



Held to CLOSE LIMITS

The child cooped in his playpen is held to close limits for his own safety and health. Midwest Welding Fittings are held to close limits to save you time and money on your welded piping. Because of their exceptional dimensional accuracy and uniformity (see below), all pipe can be cut in advance according to drawings with assurance of accurate fit. Welders do not have to spend costly time struggling to line up fittings and pipe. Welding proceeds rapidly and economically with no time-wasting compensation for inaccuracies. It will pay you to specify "Midwest" the next time you order welding fittings.

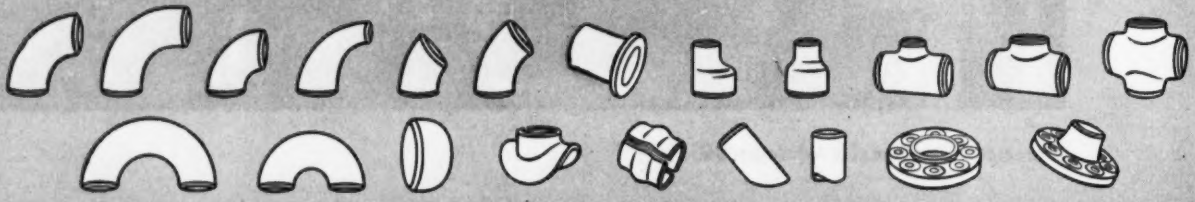


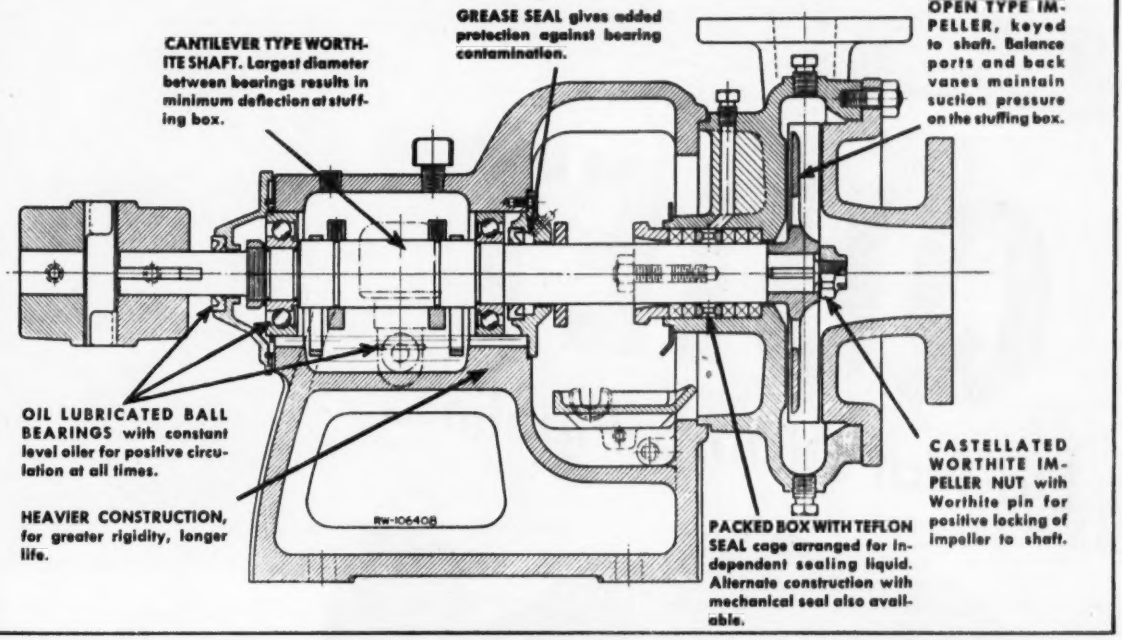
Midwest Welding Elbows are accurately sized in totally enclosed compression dies that exactly control metal distribution throughout fitting. The result is true circular cross section and accurate radius, included arc, and tangents.

MIDWEST PIPING COMPANY, INC.
(Formerly Midwest Piping & Supply Co., Inc.)
Main Office: 1450 S. Second St., St. Louis 4, Mo.
Plants: St. Louis, Passaic, Los Angeles and Boston
Sales Offices:
New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Los Angeles 33—520 Anderson St. • Houston 2—1213 Capitol Ave.
Tulsa 3—234 Wright Bldg. • Boston 27—426 First St.
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

MIDWEST WELDING FITTINGS

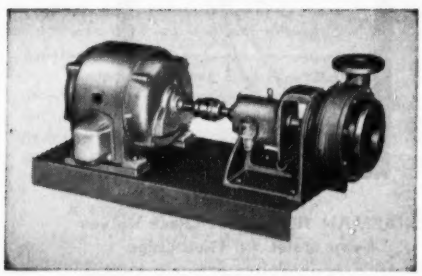
MIDWEST WELDING FITTINGS Improve Piping Design and Reduce Costs




CANTILEVER TYPE WORTHITE SHAFT. Largest diameter between bearings results in minimum deflection at stuffing box.
GREASE SEAL gives added protection against bearing contamination.
OPEN TYPE IMPELLER, keyed to shaft. Balance ports and back vanes maintain suction pressure on the stuffing box.
OIL LUBRICATED BALL BEARINGS with constant level oiler for positive circulation at all times.
HEAVIER CONSTRUCTION, for greater rigidity, longer life.
RW-10640B
PACKED BOX WITH TEFLON SEAL cage arranged for independent sealing liquid. Alternate construction with mechanical seal also available.
CASTELLATED WORTHITE IMPELLER NUT with Worthite pin for positive locking of impeller to shaft.

New features make Worthington's corrosion-resistant pumps better than ever

Worthington also increases size and capacity range of Worthite pumps, standardized with packed box or with Worthington mechanical seal



THE NEW CNG WORTHITE PUMP comes in 21 sizes, ¾" to 6", up to 2000 gpm. Heads up to 200 feet. Write for our new Bulletin W-350-B14 to Worthington Corporation, Centrifugal Pump Division, Harrison, New Jersey. C.3.7

CENTRIFUGAL STOCK PUMPS
Type FP. Handle all kinds of stock up to 6½% consistency. 6 sizes. Capacities up to 6000 gpm; heads up to 160 ft.

GENERAL PURPOSE PUMPS
Type CN. Single stage. Sizes ⅝ in. to 6 in. Capacities up to 2400 gpm; heads to 390 ft.

BOILER FEED PUMPS
Capacities up to 2000 gpm; pressures to 1250 psi.

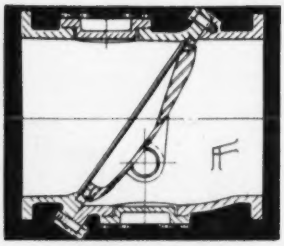
WORTHINGTON
Centrifugal Pumps

QUIET

Do Not Disturb Pipelines

You hang this sign on every line, when you install Chapman Tilting Disc Check Valves. For these unique check valves don't slam or hammer, under usual piping arrangements. And that means no damage to pipeline joints . . . virtually no wear in the valve itself.

Cross section at the right shows you how the airfoil design of the disc makes these valves *keep quiet* all their working lives . . . shows you why, in any installation, head loss is reduced over regular swing-type checks. Send for Publication No. 30, showing charts of test-results at leading engineering laboratories. Write today.



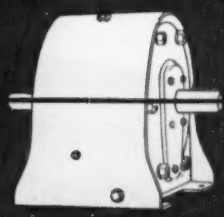
Here's why
CHAPMAN Tilting Disc Check Valves
***Keep Quiet* All Their Lives**

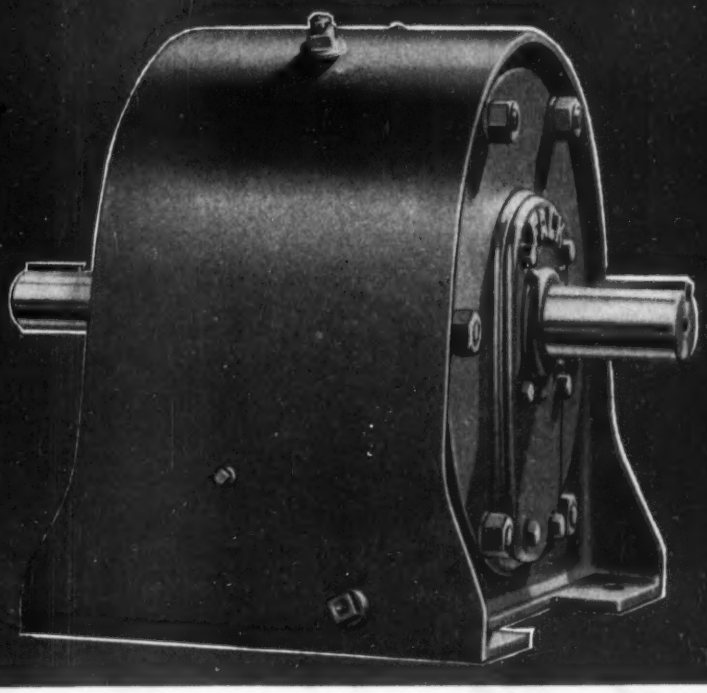
This specially designed "airfoil" disc balances perfectly in open position . . . then drops easily to closed position (cushioned by the flow). No jarring or slamming, in usual pipe-layouts. Write for bulletin.

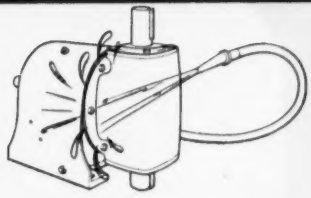
CHAPMAN TILTING DISC **CHECK VALVES**

The versatile, STRAIGHT LINE ALL-STEEL FALK SPEED REDUCER

(Concentric Type)







The Type "C" Speed Reducer has these "In-built" Factors:

Sealed Housings. Dual closures and one-way vents keep oil in, dust and moisture out. Units are splash-proof, leakproof, dust-proof.

Positive Lubrication. Large sump capacity . . . oil-tight construction assures clean lubricant . . . direct dip of revolving elements provides positive lubrication at all speeds.

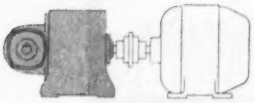
Precision Gearing. Heat treated alloy steel, precision cut and shaved helical gearing throughout . . . quiet-operating crown shaved pinions . . . taper bored gears for easy ratio changes.

Wide Speed Range. Selective ratio combinations provide output speeds from 1.5 rpm to 1430 rpm with stock gears.

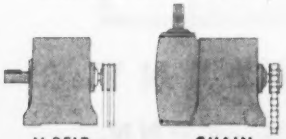
All-steel Housings. Unbreakable, strong, rigid. Generous overhung load capacities provided by wide bearing spans, large shafts and bearings.

Streamlined inside and outside. Smooth, clean surfaces; machine welded construction conforms to NEMA motor frames.

A FEW TYPICAL DRIVES FOR "C" AND "CB" UNITS



COUPLING TO "CB" UNIT



V-BELT TO "C" UNIT

CHAIN TO "CB" UNIT

The ideal type for Turbine, Engine or Special Motor

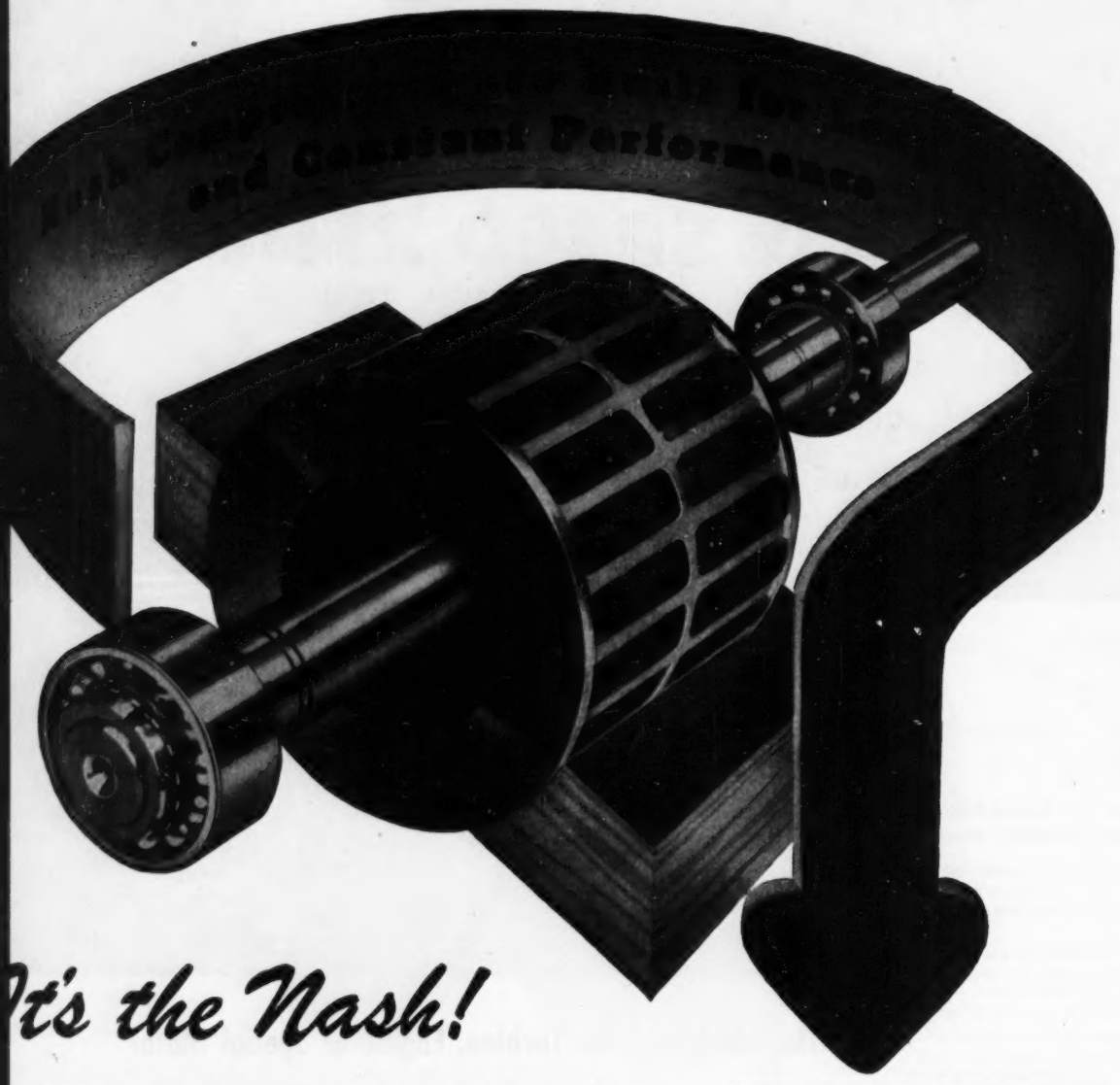
Here is an exceptionally versatile member of the famous FALK line of reduction units. The Type "C" Straight Line Speed Reducer is an all-steel concentric shaft unit rated in accordance with AGMA standards. It is structurally similar to the universally popular FALK Motoreducer, and offers many special application advantages.

It can be driven by motor, turbine or engine with direct coupling connection—or through a V-belt or chain drive. It lends itself effectively to hydraulic coupling, brake-wheel or overload protective coupling, multi-speed transmission, or to variable speed drives—without modification. Units can include self-contained backstop if desired. Ratio can be modified with easily installed stock gears. With modifications, unit can be used as a speed increaser.

These all-steel Straight Line Speed Reducers are *available for prompt delivery* in standard ratios in horizontal and vertical concentric models, also in horizontal and vertical right-angle models; in single, double, triple and quadruple reduction. For full details, write for Bulletin 1104.

FALK ...a good name in industry

THE FALK CORPORATION · 3001 W. Canal St. · Milwaukee 8, Wis.



It's the Nash!

e ability of Nash Compressors to maintain original performance er long periods is no accident. Nash Compressors have but a single oving element, the Nash Rotor. This rotor is precision balanced for ng bearing life, and it revolves in the pump casing without metallic ntact. Internal lubrication, frequent cause of gas contamination, is t employed in a Nash. Yet, these simple pumps maintain 75 lbs. essure in a single stage, and afford capacities to 6 million cu. ft. r day in a single compact structure.

Nash Compressors have no valves, gears, pistons, sliding vanes or ner enemies of long life. Compression is secured by an entirely dif- ent principle of operation, which offers important advantages often answer to gas handling problems difficult with ordinary equipment. Nash Compressors are compact and save space. They run without ration, and compression is without pulsation. Because there are no ernal wearing parts, maintenance is low. Service is assured by a tion-wide network of Engineering Service offices. Write for lletins now.

- No internal wearing parts.
- No valves, pistons, or vanes.
- No internal lubrication.
- Low maintenance cost.
- Saves floor space.
- Desired delivery temperature Automatically maintained.
- Slugs of liquid entering pump will do no harm.
- 75 pounds in a single stage.

NASH ENGINEERING COMPANY

312 WILSON, SO. NORWALK, CONN.

YOU CAN'T GO WRONG

when you turn to Proctor & Schwartz with your drying problem

Here's why. Every installation of Proctor drying equipment is backed by these three things: (1) A thorough analysis of the problem . . . (2) Proctor engineers' comprehensive knowledge of sound dryer design . . . and (3) Their reputation for installing systems that perform according to guaranteed specifications.

The background on which Proctor engineers draw when working on a drying problem covers a longer period of time (70 years) . . . and a wider range of products than can be found anywhere else in the world.

Name a product that is being dried commercially and there is a 99% chance it is being done in a Proctor system. This represents a breadth and depth of dryer design experience that is unequalled.

When you have a drying problem—the easiest and safest approach is to call Proctor engineers early. That way you can't go wrong.

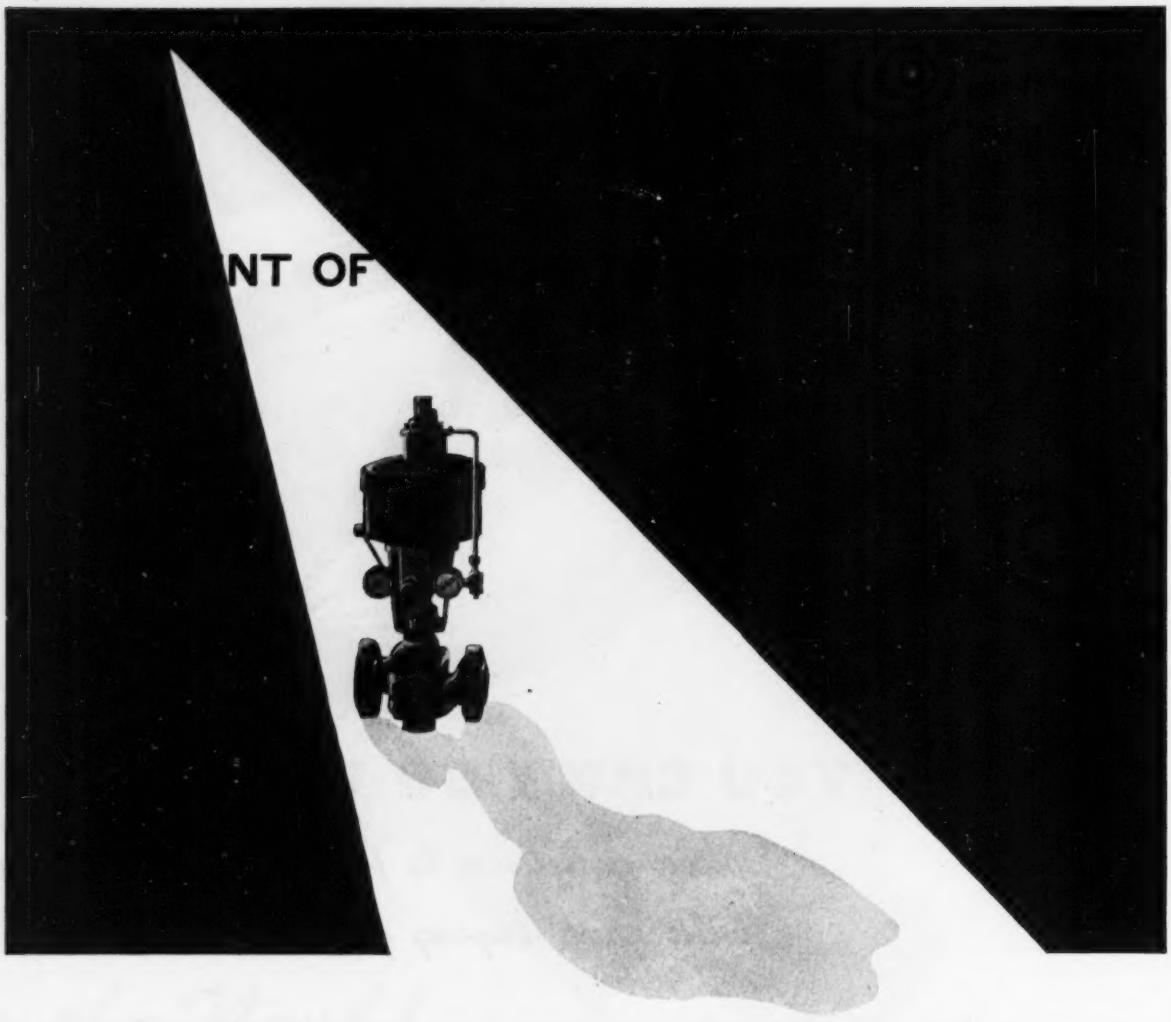
"Send for new booklet on Proctor equipment f
the Process Industries. Write for Bulletin #39

PROCTOR & SCHWARTZ • INC •

PHILADELPHIA 20 • PA •

The World's First Name in Industrial Drying Equipment and Processing Machine

TRAY DRYERS • TRUCK DRYERS • CONTINUOUS CONVEYOR SYSTEMS
PRE-FORMING FEEDS • INFRA-RED FREEZE DRYING SYSTEMS • SPRAY DRYING •



SERIES LB CONOMOTOR CONTROL VALVES

Great strides have been made in recent years in the fields of instrumentation and automatic control. Most consideration has been given to primary elements, signal transmission and control instruments. But, not much has been done to radically change the *final control element.*

In the past decade Conoflow has made many contributions to the field of Final Control Elements by the development of pneumatic operators for throttling control service. Today, the Conoflow LB Control Valve represents one of the greatest forward steps in control valve design. We believe it heralds a new era of original thinking in keeping with the modern standards of the completely automatic plant.

The LB Conomotor Control Valve features a new type of pneumatic operator with ability to *sense* and *position*, and with *power* to operate under sudden load changes. It is mechanically sound with reliable *accuracy* and *stability.* It combines a new design of the already approved Conomotor Cylinder operator with a single seated, split body, integral bonnet valve, with an honest-to-goodness renewable seat ring and a fully guided plug and stem assembly. Result . . . the optimum in control and dependability.

Tho designed for the processing and power industries, Cylinder Conomotor Valves are finding application in hundreds of services that demand accurate and trouble-free control of a wide variety of fluid flows. Chances are, this is the all-important final link you have long sought for your control loop. It's worth talking over . . . Just write or phone today.

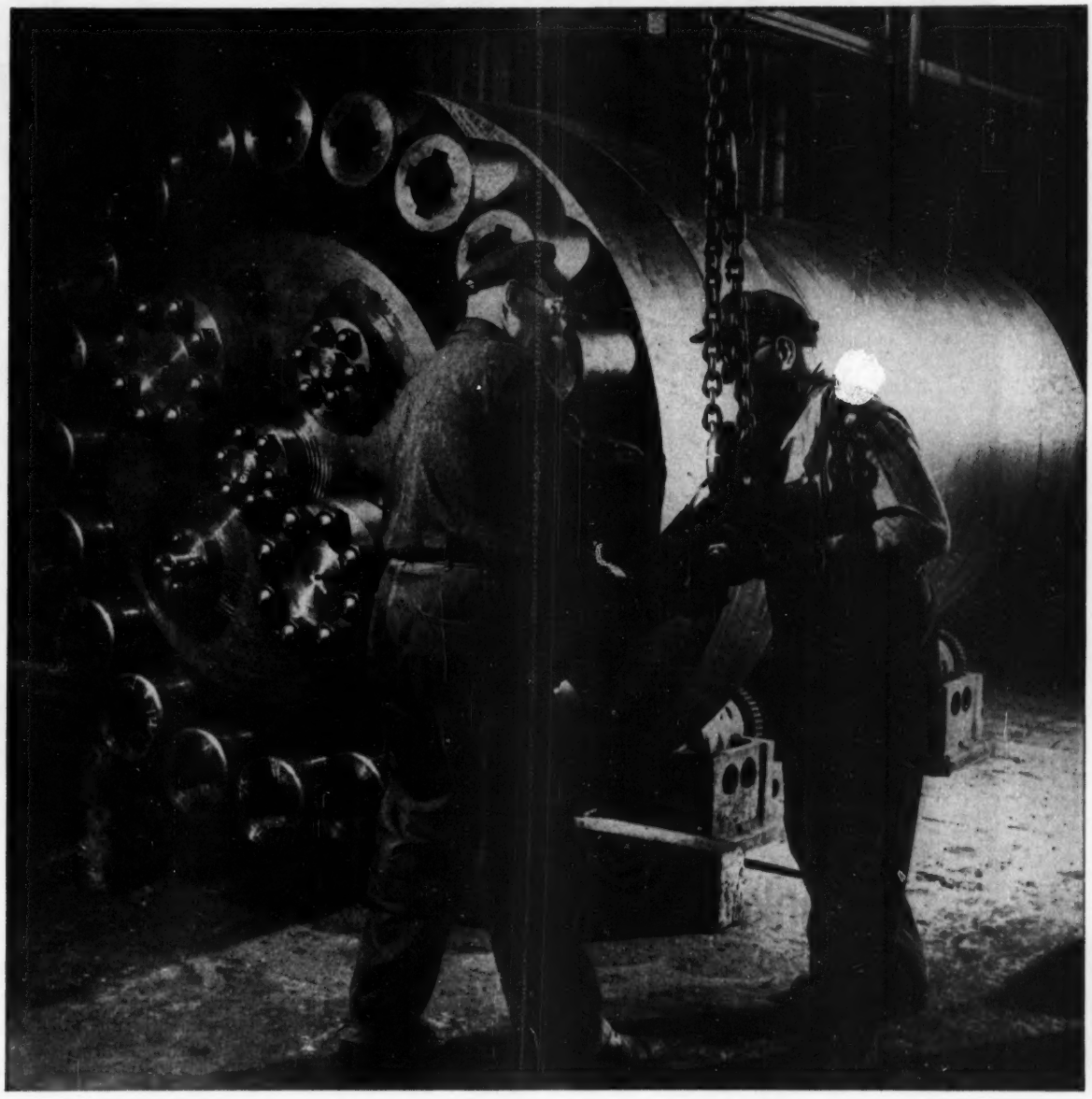
Write for Catalog LB-1, heralding this new "Step Ahead in Cybernetics."

CC-901

CONOFLOW CORPORATION

Foremost Manufacturers of Final Control Elements

2100 ARCH STREET, PHILADELPHIA 3, PENNSYLVANIA



For Pressures of Tons per Square Inch

As pressure vessels go, this isn't a giant, but in all-around strength and ruggedness it would be hard to beat. Though short, it has walls that are thick to the point of massiveness. Here is a vessel intended not for moderate service, but to contain pressures of literally tons per square inch.

It is the sort of vessel that Bethlehem is well equipped to build in its forge and machine shops. Of course, many we do are larger, some are smaller—but there is one thing common to all of them: strength. Only the finest steel is used, and the craftsmen who forge and machine the steel are not content till every specification is truly met.

Our facilities enable us to furnish you with practically all sizes and styles of forged pressure vessels. These are of seamless design, single- or multiple-section, and they include such types as autoclaves, converters, high-pressure accumulators, separators, filters, and reactors.

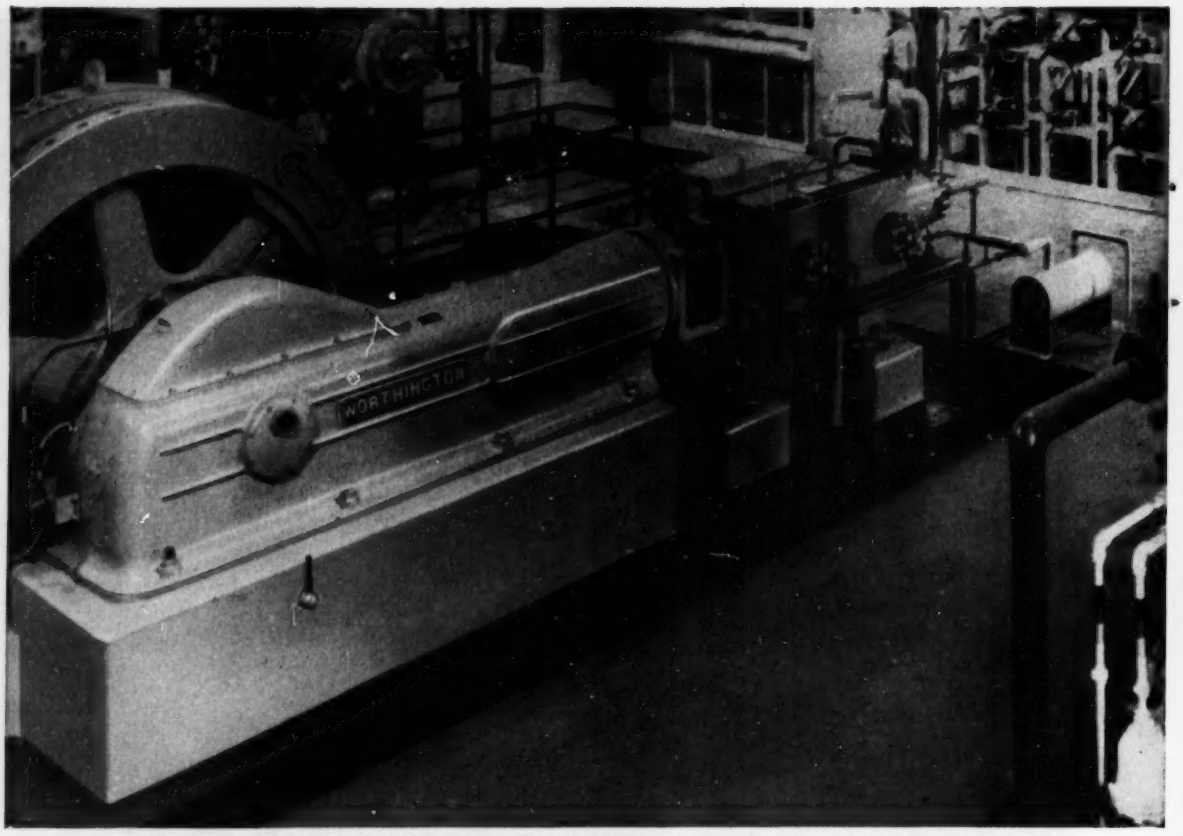
We hope you'll remember, too, that Bethlehem has a staff of engineers who specialize in pressure vessels. They are always available for technical aid, and you'll find that they work in complete harmony with your own staff. By all means ask for their services whenever they can be helpful to you.

BETHLEHEM STEEL COMPANY

BETHLEHEM, PA.

BETHLEHEM STEEL

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation



HIGH-PRESSURE WORTHINGTON RECIRCULATOR-COMPRESSORS help to manufacture synthetic ammonia at the Hooker Electrochemical Company in Tacoma, Washington. Gaseous nitrogen and hydrogen are compressed, circulated through a catalyst, and converted under maintained pressure and temperature into synthetic ammonia. The Chemical Construction Corporation of New York engineered this installation.

Hooker uses efficient Worthington unit in NH_3 synthesis

The Hooker Electrochemical Company in Tacoma needed a recirculator-compressor that would operate dependably and efficiently at the extremely high pressures involved in the manufacture of synthetic ammonia.

Worthington answered this need by supplying a Worthington High-pressure Recirculator-Compressor, with a discharge pressure of over 5000 psig. This was a routine operation for Worthington engineers, since they have furnished similar units on many previous occasions.

The compressor cylinder, complete with packing boxes, is a one-piece forging. The piston rod, piston and tail rod are also integrally forged. These features insure the accurate alignment essential to successful operation of high pressure equipment. And this alignment is maintained throughout years of operation.

This is another example of the way a manufacturer benefits by Worthington's skilled application engineering and the completeness of the Worthington line. Because Worthington manufactures compressors of every size and type, there's a Worthington machine that will exactly fit *your* needs. Get in touch with your nearest Worthington district office, or write to Worthington Corporation, Compressor Division, Section K.3.2, Buffalo 5, N. Y.

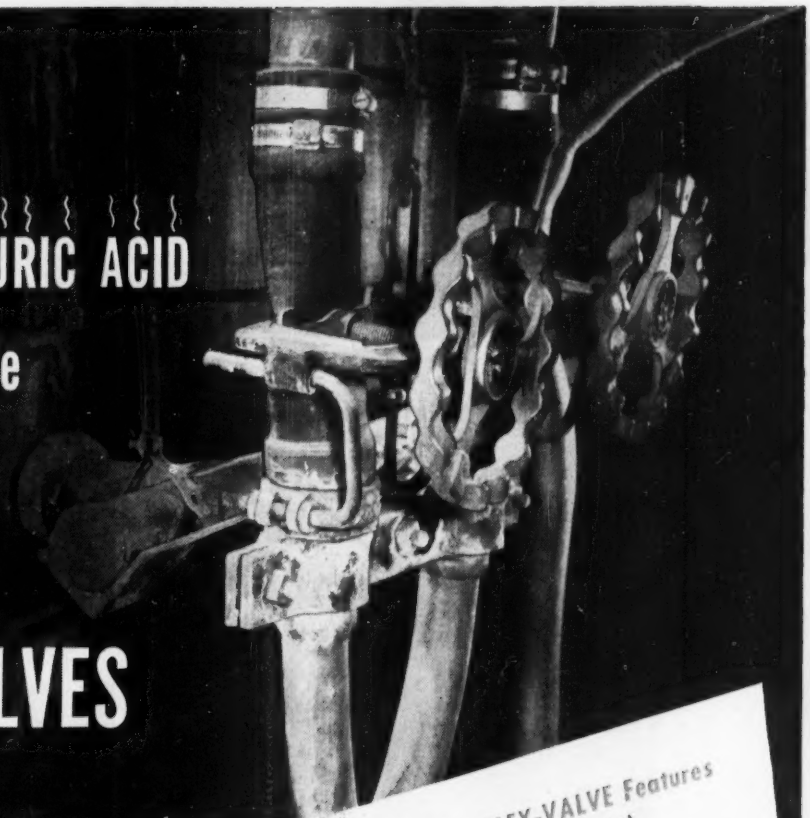
K.3.2

WORTHINGTON

Only Worthington Compressors give you Feather Valve Performance

Y-Types • Balanced Angle • Horizontal • Portable • Radial • Gas Engine Compressors

NOT EVEN HOT SULPHURIC ACID affects the efficiency of these FLEX-VALVES



A solution of copper sulphate with a high concentration of sulphuric acid—at approximately 180° F—has failed to give these valves trouble in more than two years. At a leading smelting and refining company*, where precious metals are refined and copper sulphate is produced, FLEX-VALVES have once again proven the superiority of their simple construction and corrosion resistant characteristics. If you have a fluid that's "too hot to handle" for ordinary valves, specify trouble-free FLEX-VALVE. Write for catalog No. FL 382.

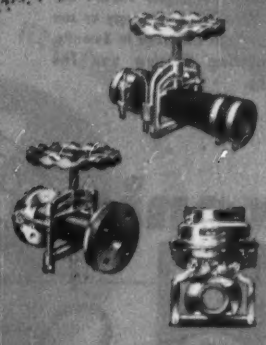
*name available on request.

Exclusive FLEX-VALVE Features
(Pat'd and Pat. Pending)

• Will outwear any metal valve on abrasive service. Proven minimum 11 to 1 life over metal • Excellent control characteristics in first 1/3 of travel • Tight on grits up to 1/8" • Valve body available in pure gum rubber, neoprene, butyl, buna-n, buna-s, food stock and special compounds • Full pipe capacity • Will not freeze up in outdoor service Complete closure for bubble-air tightness • No obstruction, pockets or internal parts.

Your Money Back if it Plugs.

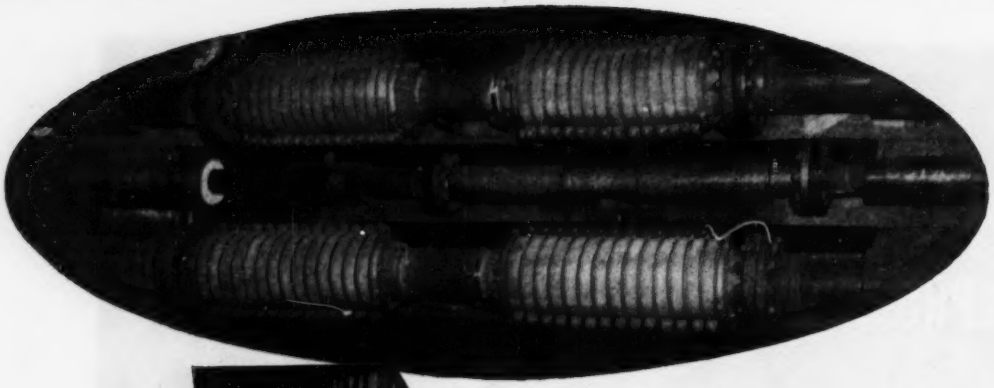
Representatives in Principal Cities

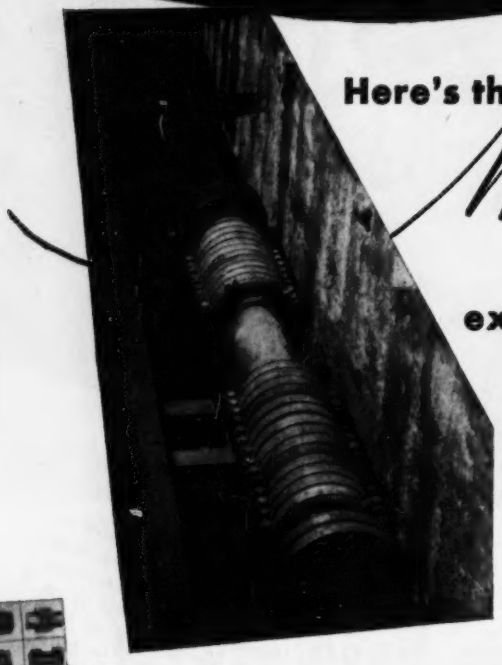


Farris FLEXIBLE VALVE CORP.

501 COMMERCIAL AVE., PALISADES PARK, N. J., U.S.A.

affiliates: FARRIS ENGINEERING CORP. • FARRIS STACON CORP. • FARRIS HYDROSEAL CORP. • FARRIS HYDROTORQUE CORP. • FARRIS PICKERING GOVERNOR CO.





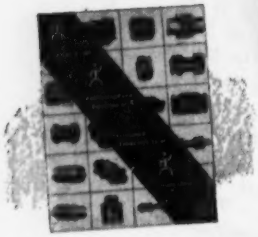
Here's the *Modern way*

to control piping expansion and contraction—

FLEXON

EXPANSION JOINTS

save space . . . require no maintenance . . . save time and money!



Here's your guide to PIPING MOTION CONTROL

The Flexon Expansion Joint Design Guide gives detailed specifications, and selection and application data for Flexon Expansion Joints. Write for your copy or see Flexon Expansion Joint Catalogs in Sweet's, Chemical Engineering Catalog and The Refinery Catalog.

You can have all the advantages of leakproof, maintenance-free pipeline motion control in a compact, easy-to-install, in-line unit when you use Flexon Expansion Joints. There is no repacking . . . no bulky, space-consuming installation . . . just install the Flexon Expansion Joint as easily as putting in a fitting, and then forget it.

Flexon Expansion Joints are offered with stainless steel or copper pressure carriers in Controlled-Flexing, Free-Flexing or Flexoniflex types. Units are available for pressures up to 5500 psi, temperatures to 800° F. (1600° F with special alloys). All types suitable for handling radial, axial and/or lateral pipe motion.

Write for the name of your nearest Flexonics representative.

Flexonics *Corporation* **EXPANSION JOINT DIVISION**

1317 S. THIRD AVENUE · MAYWOOD, ILLINOIS

FORMERLY CHICAGO METAL HOSE CORPORATION

In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

Flexon identifies products of Flexonics Corporation that have served industry for over 50 years.

Flexible metal hose

Expansion joints.

Aircraft components

Metallic bellows

how to SOLVE your LOW-CAPACITY FLOW CONTROL problems

This new 16-page Bulletin 1053 on Air-Powered Controlled Volume Pumps is your guide to precise flow rate control of low-capacity chemical and slurry streams. It contains a graphic presentation of pump operating principles; capacity-pressure and air-consumption tables; examples of complete Milton Roy engineered chemical feed systems, using these instruments.

Solve *your* low-capacity flow control problems. Send for your copy of Bulletin 1053, *now*.

Q. What are Controlled Volume Pumps?

A. Reciprocating, positive displacement, flow control instruments, driven by air or electric motor. They pump with a repetitive accuracy of plus or minus one percent. Capacities from 3. milliliters per hour to 45 gallons per minute . . . Pressures to 25,000 pounds per square inch. Capacity adjustment—manual . . . or automatic response to a control signal from an electronic or pneumatic control instrument.

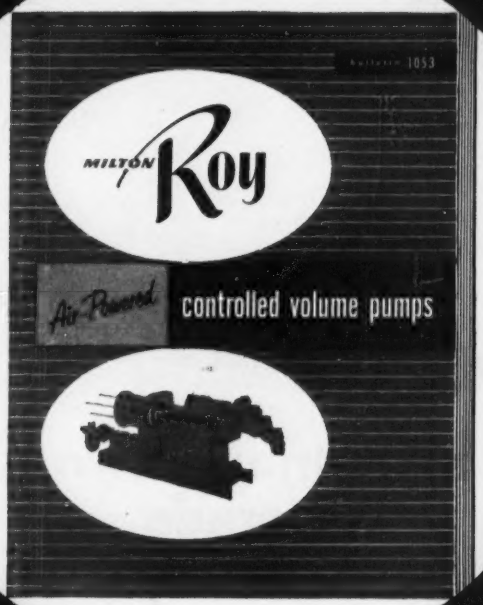
Q. Where are Controlled Volume Pumps Used?

A. Across all industry . . . for flow control and pumping of precise quantities of chemicals and slurries . . . for accurate ratioing of chemical streams . . . and for automatic control of a process variable, such as pH, using these pumps as final control elements.

Q. What is the Milton Roy Exclusive Step-Valve Liquid End?

A. A patented step-valve liquid end with individually inspectable ball checks (to facilitate cleaning). Sloping passages purge entrained air, assuring high repetitive volumetric efficiency.

Engineering Representatives in the United States, Canada, Mexico, Europe, Asia, South America and Africa



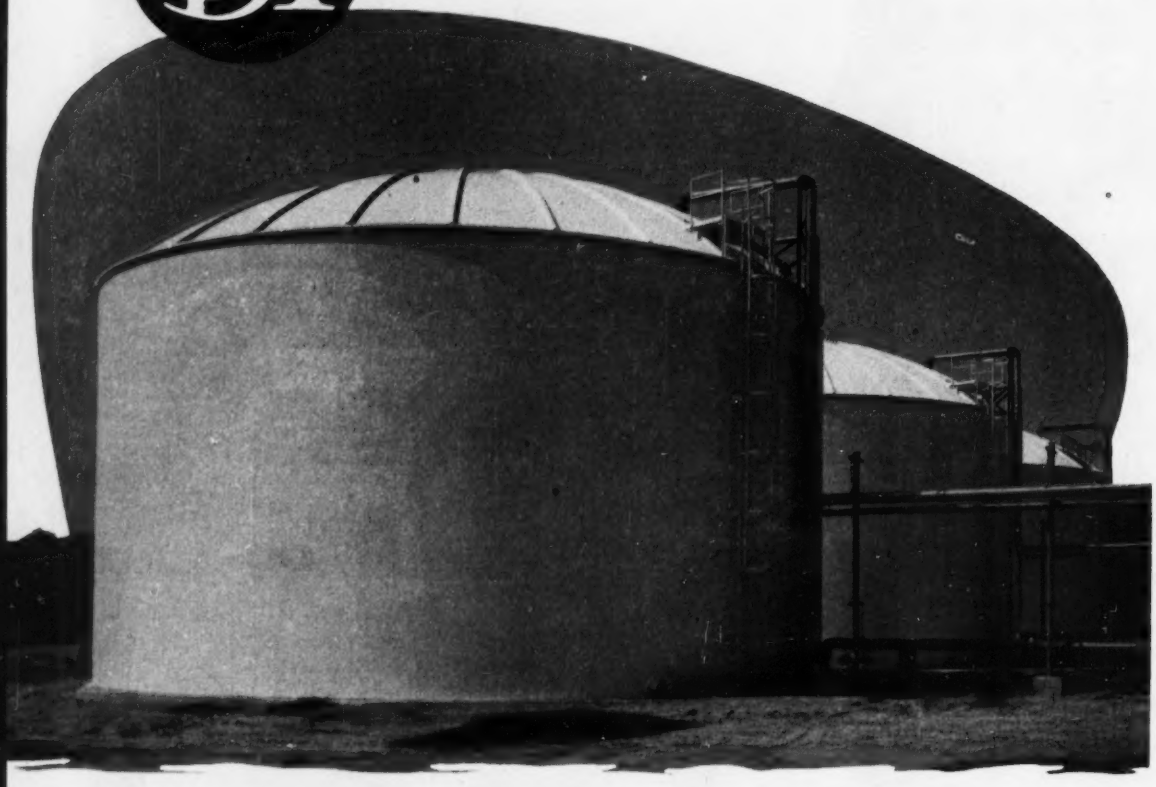
CONTROLLED VOLUME PUMPS ARE FLOW CONTROL INSTRUMENTS

Roy

Manufacturing Engine KMAID LANE • PHILA. 18, PA.

CONTROLLED VOLUME PUMPS AND AUTOMATIC CHEMICAL FEED SYSTEMS

STAINLESS CLAD TANKS



store ammonium nitrate at El Dorado

The Horton® stainless clad tanks shown above were installed to store an 83 per cent solution of ammonium nitrate at the Lion Oil Company's chemical plant at El Dorado, Arkansas.

The ammonium nitrate is converted at the rate of about 400 tons per day into dry pelleted fertilizer, one of five nitrogen products produced at the plant.

Horton stainless clad tanks, like those at Lion Oil, are widely used for storage wherever corrosion is a problem.

If you have a storage problem or are in need of additional storage facilities, write our nearest office for estimates or quotations on carbon steel, stainless steel or stainless clad tanks to meet your needs. There is no obligation on your part.

CHICAGO BRIDGE & IRON COMPANY

lanta 3.....2120 Healey Building	Detroit 26.....1503 Lafayette Building	Pittsburgh 19.....3205 Alcoa Building
rmingham 1.....1510 North Fiftieth Street	Houston 2.....2103 C & I Building	Salt Lake City 4.....505 West 17th South Street
ston 10.....1005-201 Devonshire Street	Los Angeles 17...1505 General Petroleum Building	San Francisco 4.....1522—200 Bush Street
icago 4.....2124 McCormick Building	New York 6.....3318—165 Broadway Building	Seattle 1.....1305 Henry Building
veland 15.....2220 Midland Building	Philadelphia 3...1625—1700 Walnut St. Building	Tulsa 3.....1623 Hunt Building

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

ADVERTISEMENT—*This entire page is a paid advertisement* *Prepared by U. S. Industrial Chemicals Co.*

U.S.I. CHEMICAL NEWS

★ A Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★

NATIONAL PETRO-CHEMICALS $45 MILLION PLANT OPENS

Dedication Ceremonies Held November 11 For Giant Industrial Chemicals Project of National Distillers and Panhandle Eastern

Season's Greetings

From
U.S.I. CHEMICAL NEWS
to its many readers,
contributors, and associates

Selector Takes Guesswork Out of Surfactant Choice

To take some of the laboratory trial-and-error out of building new emulsion formulas with surfactants, results of a manufacturer's experimentation are now available, condensed in the form of an automatic surfactant "selector". The instrument, a pocket-size twin dial arrangement, is said to offer emulsion formulators a precise surfactant recommendation for 96 different and specific formulation problems. Printed on durable card stock, the device measures 10⅝ by 6¾ inches and is accompanied by full directions. The formulas chosen for use on the dials are typical and basic. Therefore, the surfactant recommendations indicated may be used as a guide in solving numerous other problems, the manufacturer states.

Surfactant applications covered on the instrument include: 18 types of cosmetic products, 9 pharmaceuticals, 22 cleaning or detergent formulations, 18 agricultural chemicals, 10 textile chemicals, and 20 miscellaneous industrial formulations such as polishes, lubricants, and soldering fluxes.

New Carbon Black Reduces Glare on Concrete Roads

A new colloidal carbon black is expected to furnish the answer to road glare on many future concrete roads, according to a recent announcement. The obvious solution to road glare is to make the road dark in color. But in the case of concrete, carbon black (the most suitable pigment) neutralizes or counteracts the air-entrainment agents commonly used to make concrete more resistant to weathering. The new colloidal dispersion has been developed especially to overcome this difficulty, it is said. A six-page brochure is available describing the use of air-entrainment agents and carbon black, and shows the proportions needed to achieve various shades of color in roads, sidewalks, and floors.

Chemical Safety Charts

Five new chemical safety charts, designed to give all the important information on handling, storing and shipping hazardous chemicals at a glance, are now available, it has been announced. A similar previous chart covered sulfuric acid. The present five deal with nitric acid, hydrochloric acid and hydrogen chloride, anhydrous and aqueous ammonia, carbon tetrachloride, and chromic acid and chromates.

Text on the charts is simple, concise and printed so as to be easily read. They are 2 by 2½ feet in size and are intended for posting in plants, warehouses, laboratories, and wherever else the chemicals are handled or stored.

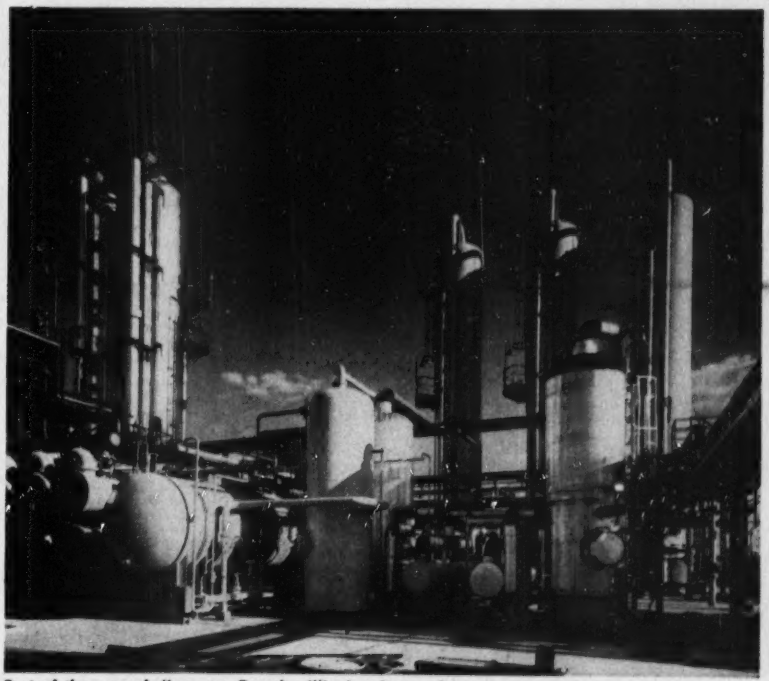
U.S.I. Ammonia and Sulfuric Acid Plants Included in Project

November 11 marked the dedication of the new $45 million National Petro-Chemicals Corp. plant at Tuscola, Illinois, where liquefied petroleum gases and industrial chemicals will be produced from natural gas. The giant plant is owned 60% by National Distillers Products Corp., which manages and operates it, and 40% by Panhandle Eastern Pipeline Co. It represents the greatest step so far taken by National Distillers in a long-range program to diversify its manufacturing operations.

Seven Major Producing Units

Located on a 500-acre site, the new plant consists of seven major producing units:

MORE



Part of the new skyline near Tuscola, Illinois, above what two years ago was prairie cornfield country. The gigantic new National Petro-Chemicals plant is owned jointly by National Distillers Products Corp. and Panhandle Eastern Pipeline Co., and will be operated by National.

U.S.I. CHEMICAL NEWS

CONTINUED

Petro-Chemicals Operation

1. Hydrocarbon extraction and fractionation
2. Ethylene production
3. Ethyl alcohol production
4. Ethyl chloride production
5. Polyethylene production (under construction)
6. Sulfuric acid manufacture
7. Ammonia manufacture (under construction)

The hydrocarbon extraction and fractionation units are the largest in the world for the recovery of hydrocarbons from natural gas. When operating at full capacity, National Petro will process 400 million cubic feet per day of natural gas, which is pumped in from Panhandle Eastern's adjacent compressor station. It will have a daily output of approximately 500,000 gallons of natural gas liquids — propane, butane, isobutane, and natural gasoline. In addition, 10 million cubic feet per day of ethane will be recovered for conversion into ethylene.

Largest Ethylene Unit Ever Built

Petro's ethylene plant, the largest single unit of its kind ever built, can turn out 200 million pounds a year. The ethylene will be used initially for the production of 40 million gallons of synthetic ethyl alcohol and 50 million pounds of ethyl chloride per year. Alcohol production will total about 25% of the country's previous synthetic output. Production of polyethylene is scheduled for the second quarter of 1955. Initial output will be about 25 million pounds per year, with further expansion scheduled for the ensuing two or three years. A substantial portion of Petro's production of all products has been contracted for under long-term agreement.

The natural gas liquids will be distributed by Phillips Petroleum Co. The propane and butane will be sold largely as liquefied petroleum gas under the familiar name "Philgas", a Phillips trademark. The isobutane production will go mostly into manufacture of components of high octane aviation gasoline. The natural gasoline will be sold to oil refiners for blending into motor fuel.

U.S.I. Plants Included in Project

Two new plants of National Distillers U.S.I. Chemicals Co. Division are also located on the Tuscola site and will be integral parts of the entire operation there. One plant is a $2 million sulfuric acid plant which provides acid for the Petro alcohol manufacturing process. Sulfuric acid is also important to fertilizer manufacture. The other plant, still under construction, is a $7 million unit to manufacture 50,000 tons of ammonia per year, some of which will be converted into nitrogen solutions widely used in fertilizer manufacture. Tuscola thus becomes one of the few places in the United States where both sulfuric acid and nitrogen solutions are produced.

Major Contractors Involved

Design of the plant required a year and the services of 400 engineers and draftsmen. More than 2,000 craftsmen were needed to turn the complex plans into reality.

J. F. Pritchard & Co., Kansas City, Mo. designed and built the hydrocarbon extraction and fractionation units, the LPG storage tanks, the power house, water treating and waste disposal units, and general services. An underground propane storage cavern was constructed by MacLean, Grove & Co., Inc., New York.

The Lummus Company, New York, designed and constructed the ethylene plant. The alcohol plant was designed by the Vulcan Copper & Supply Co., Cincinnati, and built by the J. F. Pritchard Co. The ethyl chloride plant was designed and built by the Foster Wheeler Corp., New York.

National Lead Company, New York, designed the acid recovery plant. Administration buildings were designed by Syl. G. Schmidt & Associates, St. Louis, and built by Felmley-Dickerson Company, Bloomington, Ill.

Design and construction of the polyethylene and ammonia plants are in the hands of M. W. Kellogg Company, New York. L'Air Liquide Society, Montreal, is designing the hydrogen and air purification plants. Leonard Construction Company, Chicago, designed and built the sulfuric acid plant; and The Chemical & Industrial Corporation, Cincinnati, is designing and building the nitric acid and nitrogen solution plants.

TECHNICAL DEVELOPMENTS

Information about manufacturers of these items may be obtained by writing U. S. I.

Designed to prevent serious Christmas tree fires, a glass globe filled with colored extinguisher decorates the top of the tree, breaks automatically at 160° F. to flood and put out any flash fire as soon as it starts. **(No. 990)**

For stabilizing foods or synergising food antioxidants, a new product called "H-124" shows promise. It acts as a very mild acid acceptor, has excellent ultraviolet absorption characteristics and remarkably low mammalian toxicity. Should be especially useful in extending shelf life of foods exposed to light and air. **(No. 991)**

For continuously measuring thickness variations down to 5 millionths of an inch on paper, plastic sheeting, metal foil, etc., a new device is said to operate on ordinary air under pressure. **(No. 992)**

A new home cleaner reportedly removes dirt, tar, rust and oil from all types of hard surfaces including metals, linoleum, tile, painted surfaces, furniture, plastics and automobiles. **(No. 993)**

Adjustable safety glasses, said to fit 90% of all faces, permit easy replacement of lenses and have a double bridge design claimed to more than double the frame strength. **(No. 994)**

An inorganic gelling and bodying agent for lubricating greases with potential uses in paints, adhesives, rubber, inks, waxes, resins and insecticides, is described as a colloidal form of the mineral attapulgite with a strong, needle-like particle structure. **(No. 995)**

To waterproof and revitalize shoes and other leather products, an aerosol chemical spray is being marketed which is claimed to protect individual cells in the leather rather than to be a plastic coating. One container treats 24 pairs of shoes, the maker states. **(No. 996)**

A new all-purpose electrical and metal degreaser is reported to be about 12 times less toxic than carbon tetrachloride, to dry faster, and to be useful on natural and synthetic fabrics as well as metals. **(No. 997)**

A new rubber film can be electronically sealed to itself, is said to permit assembly of vessels of any size with welded seams stronger than the material itself. **(No. 998)**

A new fast drying aluminum paint can withstand 1200° F. temperatures without discoloring or blistering, can be used for plating burners, stoves, hot pipes, ovens, radiators, etc., according to the manufacturer. **(No. 999)**

PRODUCTS OF U.S.I.

ALCOHOLS
Amyl Alcohol (Isoamyl Alcohol)
Butanol (Normal-Butyl Alcohol)
Fusel Oil — Refined
Propanol (Normal-Propyl Alcohol)

Ethanol (Ethyl Alcohol)
Specially Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof U.S.P., Absolute—200 Proof
Solox*—proprietary solvent—regular and anhydrous

ANTI-FREEZE
Super Pyro* Anti-Freeze
U.S.I. Permanent Anti-Freeze

ETHERS
Ethyl Ether, U.S.P.
Ethyl Ether, Absolute—A.C.S.

ACETONE—A.C.S.

ANISOLS
Ansol* M
Ansol* PR

ACETIC ESTERS
Amyl Acetate—Commercial and High Test
Butyl Acetate
Ethyl Acetate—all grades
Normal-Propyl Acetate

OXALIC ESTERS
Dibutyl Oxalate
Diethyl Oxalate

PHTHALIC ESTERS
Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate

OTHER ESTERS
Diatol*
Diethyl Carbonate
Ethyl Chloroformate

RESINS (Synthetic and Natural)
Arochem*—modified types
Arodura*—urea-formaldehyde resins
Arofene*—pure phenolics
Arofint*—for special flat finishes
Arofint*—room temperature curing phenolic
Aroplaz*—alkyds and allied materials
Aropol*—copolymer modified alkyds
Ester Gums—all types
Natural Resins—all standard grades

INSECTICIDE MATERIALS
Allethrin
CPR Concentrates: Liquid & Dust
Piperonyl Butoxide
Piperonyl Cyclonene
Pyrenone* Concentrates: Liquid & Dust
Pyrethrum Products: Liquid and Dust
Rotenone Products: Liquid and Dust

INSECTIFUGE MATERIALS
Indalone*
Triple-Mix Repellents

INTERMEDIATES
Acetoacetanilide
Acetoacet-ortho-chloroanilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloroanilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodium Oxalacetate

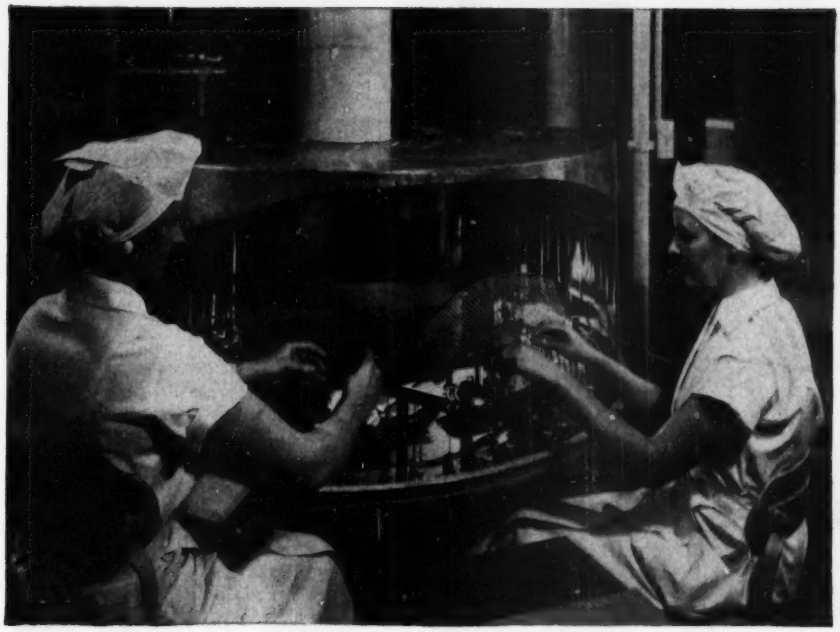
FEED PRODUCTS
Calcium Pantothenate (Feed Grade)
Choline Chloride
Curbay B-G* 80
DL-Methionine (Feed Grade)
Niacin, U.S.P.
Riboflavin Concentrates
Special Liquid Curbay*
U.S.I. Vitamin B_{12} and Antibiotic Feed Supplements
Vacotone* 40

OTHER PRODUCTS
Acetaldehyde
Caustic Soda
Ethylene
IPC (Isopropyl-N-Phenyl Carbamate)
CIPC
Liquid Chlorine
Metallic Sodium
Methionine (Pharm.)
N-Acetyl DL-Methionine
Nitrocellulose Solns.
Propionaldehyde
Propionic Acid
Sulfuric Acid
Urethan, U.S.P.

*Reg. U.S. Pat. Off.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers Products Corporation

120 BROADWAY, NEW YORK 5, N. Y. BRANCHES IN ALL PRINCIPAL CITIES



This machine (one of a dozen) washes, sterilizes and DRIES glass ampoules at Eli Lilly and Company, Indianapolis. Ampoules placed over needle jets receive a bath of steam, distilled water and DRY air in two complete cycles.

Eli Lilly and Company Takes No Chances with MOISTURE . . .

To preserve the therapeutic potency of many vital drugs, Eli Lilly and Company keeps them DRY and hermetically seals them in DRIED ampoules. After steam and distilled water sterilize each ampoule, warm DRY air flushes out every trace of moisture. Then the ampoules are filled in an extremely DRY atmosphere.

Lectrodryers are strategically placed throughout Eli Lilly and Company plants. They DRY air to prevent moisture interference in drug quality and to help keep production flowing smoothly.

Perhaps DRY air, gas or organic liquid will solve a moisture problem for you. If you have the slightest doubt, write for *Because Moisture Isn't Pink.* This booklet describes Lectrodryers, the amount of DRYness they can supply and how they are working in many industries.

Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Pennsylvania.

A BWC-500 Lectrodryer* stands behind four compressors which supply air to the ampoule washing machines. Air from the compressors at 15 to 20 psi passes through the Lectrodryer, for thorough DRYing, and on to the ampoule washers.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In France: Stein et Roubaix, 24 Rue Erlanger, Paris XVI.
In Belgium: S. A. Belge Stein et Roubaix, 320 Rue du Moulin, Bressoux-Liege.

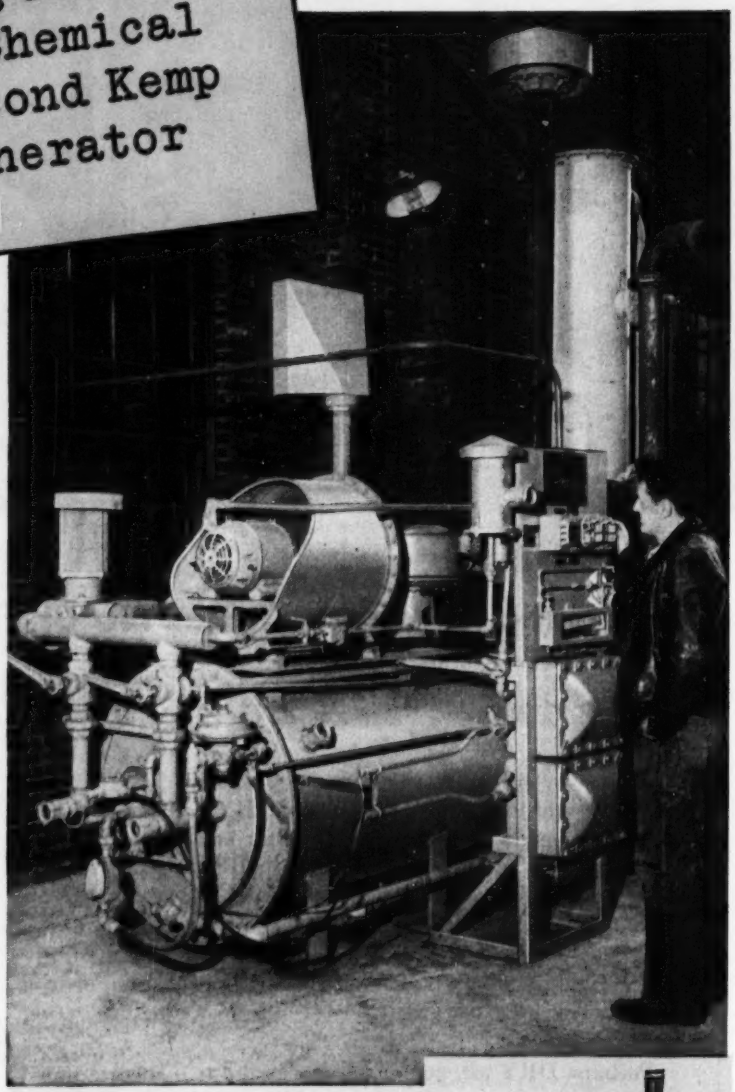
LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

* REGISTERED TRADEMARK U.S. PAT. OFF.

Case No. 58

Results Bring Re-Order from Heyden Chemical Corp. for Second Kemp Inert Gas Generator



Heyden Chemical doubles its blanketing savings with Second Kemp Generator

HERE'S A CASE where simple mathematics paid big dividends at this Garfield, New Jersey plant. When Heyden Chemical—one of the nation's leading producers of formaldehyde, pentaerythritol, salicylic acid, etc.—installed its first Kemp Inert Gas Generator to furnish CO_2 for blanketing a special grinding operation, it was on more or less a test basis. Part of Heyden's constant search for newer, better, cheaper ways to improve its products. The rest of its blanketing needs were still being handled with CO_2 from large storage tanks in the plant.

Immediate Savings with Kemp

Results with the first Kemp Inert Producer were impressive. Now a second (see right) Kemp unit has been installed and actual savings over previous costs are estimated at over $500 a month for the first year. In addition to dollars saved, Kemp Generators assure a safe, dependable supply of chemically clean inerts. Deliver inerts at a special analysis . . . without fluctuations.

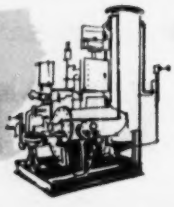
Kemp Designs Versatile

If you still rely on old-fashioned inert sources or are dissatisfied with present inert equipment, let Kemp help you, too. Kemp Engineers will be most happy to help solve your inert problems . . . show you how you can get similar results with fast-starting, easy-to-operate Kemp Generators. It costs you nothing to investigate. And it may save you real money.

Photo at right shows close-up view of Kemp Industrial Carburetor. Part of every Kemp installation, it eliminates tinkering, waste. Assures complete combustion at all times. Reduces installation costs and maintenance.

For more complete facts and technical information, write for Bulletin I-10 to:
C. M. KEMP MFG. CO., 405 East Oliver Street, Baltimore 2, Maryland.

KEMP OF BALTIMORE



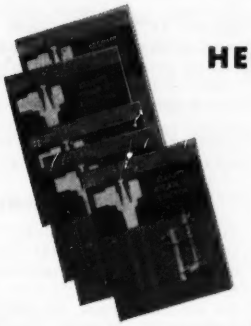
INERT GAS GENERATORS

CARBURETORS • BURNERS • FIRE CHECKS
METAL MELTING UNITS • ADSORPTIVE
DRYERS • SINGEING EQUIPMENT

Nothing takes the place of experience

THAT SERIAL NUMBER is the strongest possible certification of the valuable "know-how" back of Elliott steam jet ejectors and their application. Over thirty thousand is a formidable number of installations, easily covering many times over every possible process for which vacuum is used, and every possible set of conditions under which steam jet ejectors can be adapted to operate most profitably.

All the experience and data behind these multitudinous ejector set-ups is available to assure the success of your installation, whether it requires the use of a simple single stage ejector, or a huge multi-stage unit with intercondensers to supply absolute pressures as low as .003 in. mercury. The cooperation of Elliott engineers is yours for the asking.



HERE IS COMPLETE DATA . . .

Five bulletins that cover the complete range of commercially obtainable vacuum. Contact your nearest Elliott representative, or write, describing your vacuum requirements and operating conditions, to Elliott Company, Jeannette, Pa.

ELLIOTT Company

STEAM TURBINES • MOTORS • GENERATORS • DEAERATING HEATERS • EJECTORS • CONDENSERS • CENTRIFUGAL BLOWERS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

INDUSTRIAL PROCESS DIVISION

G3-3

UNICHROME
Trade Mark

News about
COATINGS for METALS
Metallic . . . . . Organic . . . . . Decorative . . . . . Protective

How to benefit most from modern coatings

HOW SPECIAL VINYL COATINGS PROLONGED PUMP LIFE

Centrifugal pumps moving salt water for a processing plant were being replaced every 12 to 18 months because of erosion and corrosion of impeller and housing. Then impellers were coated with 30 mils of a vinyl Unichrome Plastisol Compound, the housings with 5 mils of an unusual vinyl Ucilon Coating System. After one year, inspection showed the coatings and pumps still in excellent condition.

This case illustrates the heavy duty protection given to metals by extra tough, resilient Unichrome Plastisols and Ucilon Protective Coatings. Applied by dipping or spraying, Unichrome Plastisols provide films from .003" to 3/16" thick. Do you have use for such a coating? Write us the details.

Vinyl drum lining resists many chemicals

There's no such thing as a "universal" drum lining – one usable with *all* types of chemicals. But there *is*, however, a Unichrome vinyl-type coating that withstands an unusually large group of them.

That's why Unichrome B-154 Lining was recommended to a chemical processor who was producing a variety of compounds and searching for a single lining to resist all. This coating was found to fill the bill – having withstood a full year of testing in contact with organic sequestering agents, sulfonated oils and textile finishing agents.

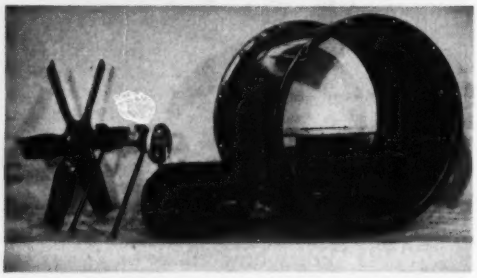
For drum lining data, send for Bulletin DL-1.

UNICHROME
Trade Mark

UNITED CHROMIUM, INCORPORATED
100 East 42nd Street, New York 17, N. Y.
Detroit 20, Mich. • Waterbury 20, Conn.
Chicago 4, Ill. • Los Angeles 13, Calif.
In Canada:
United Chromium Limited, Toronto, Ont.

Unusual service life assured when Ucilon* Protective Coating Systems are specified as original-equipment-finish to meet corrosive conditions . . . and for maintenance, too.

Equipment designed for industrial use often encounters conditions so corrosive that ordinary finishes give short lived protection. What then? The maintenance engineer has to discover, often at considerable effort, protective coatings that *can* resist the strong corrosives; and then apply these to the surfaces which, at considerable extra expense, have again had to be adequately prepared for the refinishing.

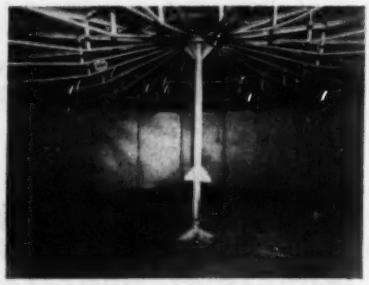


New equipment to be in contact with corrosive fumes is better equipped for service with Ucilon Coating protection.

Systems of Ucilon Protective Coatings are being selected by many chemical, corrosion and research engineers for this job on the basis of their proved durability; also their resistance to strong acids, alkalies, salt solutions, alcohols, oils or other finish-destroying compounds.

PROTECTION SHOULD START WITH ORIGINAL FINISH

It stands to reason that if a coating system proves its worth when used for *maintenance*, it will prove even more worthwhile when used as the *original* finish. Thus, because of the unusually long protection obtained when Ucilon Coatings are applied to maintain equipment against corrosion-damage, more and more companies are now beginning to specify these coatings right from the start for *new* equipment. This not only improves the product functionally, but also simplifies subsequent maintenance.



Interior of large brine tank for which Ucilon Protective Coating System was specified.

PROTECT AGAINST FUMES, CHEMICALS OR WATER

A great majority of coating problems arise from such conditions as continuous or intermittent contact with fumes, chemical solutions or water. Systems of Ucilon Coatings developed to combat these primary causes of coating failure include vinyl, phenolic, chlorinated rubber and fish oil formulations. Sixteen systems of Ucilon Coatings now exist which afford the needed protection and durability against over a hundred corrosives. A "system" may include special primers and intercoats in addition to a specific number of topcoats.

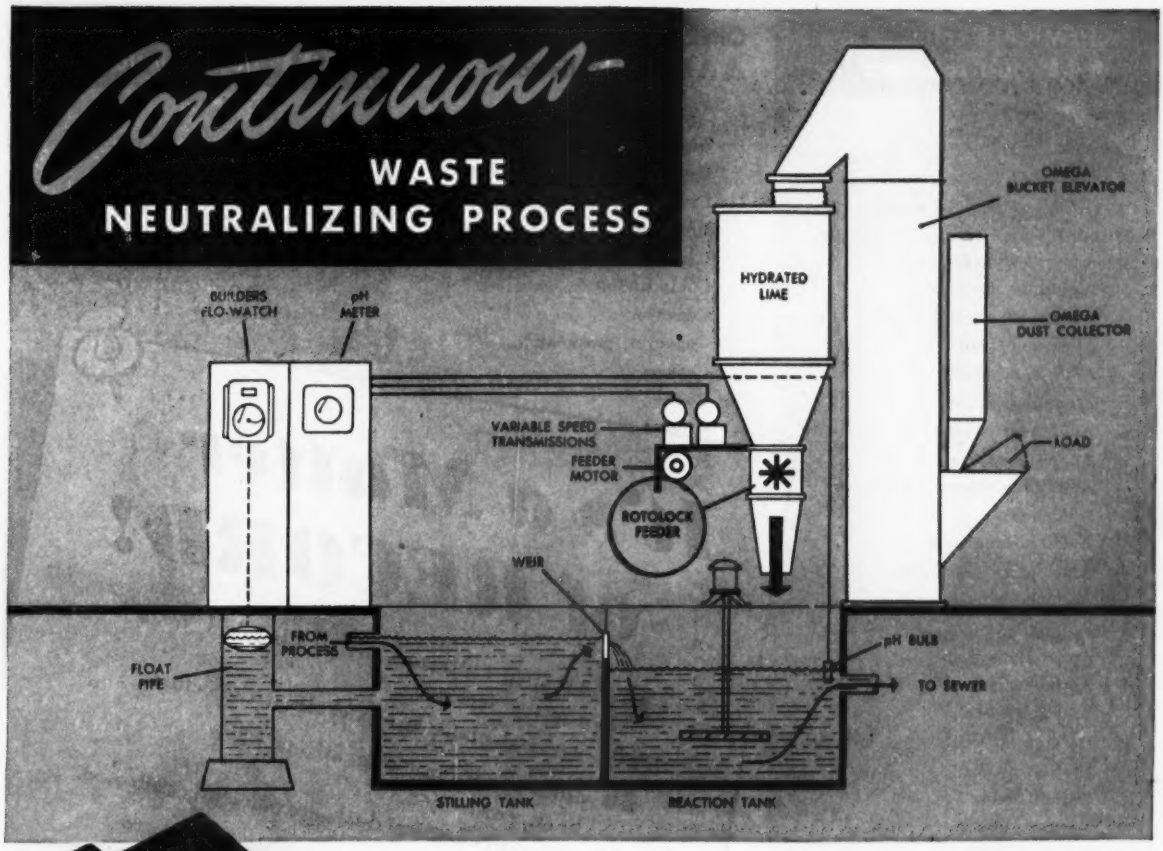
QUICK PICTURE OF RESULTS

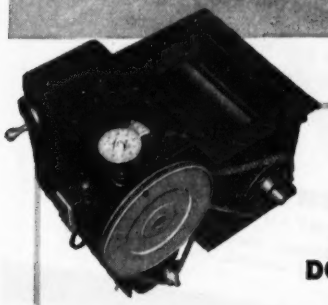
Interior of brine tanks still protected 5 years after application of Ucilon Coating System . . . 5 years' service obtained against HCL fumes with virtually no patchwork of the Ucilon Coatings needed . . . No failure observed after almost two years of Ucilon Coating protecting tank car carrying saturated ammonium nitrate solution . . . Even after 3 years, no deterioration seen in Ucilon Coatings on steel submerged in sewage.

CONCLUSIONS

To get the most benefit from today's protective coatings, (1) determine what corrosives must be combatted; (2) select a Ucilon Coating System recommended for the conditions; (3) specify it for any new equipment to be installed; (4) apply it on present equipment and structural surfaces for longer lasting protection and to reduce frequency of "painting." Write for bulletin MC-7. **Trade Mark*

Continuous— WASTE NEUTRALIZING PROCESS





OMEGA ROTOLOCK DOES THE JOB

Omega Rotolock — a rotating vane feeder — feeds hydrated lime into the reaction tank in response to the flow of acid waste (measured by a Builders Flo-Watch Instrument) and to the degree of neutralization (measured by a pH meter).

The Rotolock is a volumetric feeder of simple design and rugged construction, easily adapted to installations requiring proportional pacing by auxiliary meters. The Feeder, powered by a ¼ HP motor, has a 100 to 1 feed range. Two models of Omega Rotolock Feeders are available, covering the complete range of feeds from 7.2 to 300 cu. ft. per hr.

Here's how Omega helped a customer's engineer solve a waste treatment problem for one of the nation's leading manufacturers of electrical and electronic equipment. This acid waste neutralizing "equipment package" comprises feeding, controlling, and metering units required for continuous, accurate operation . . . Omega bucket elevator, dust collector, storage hopper, Rotolock Feeder, and Builders Instruments and Control Panel. Performance of this "package" under actual job conditions has proven again that it pays to take advantage of Omega's engineering and manufacturing experience, when you need continuous proportioning equipment.

Hundreds of today's processing and production problems are being solved by Omega "packages"— for waste treatment, for proportioning two or more solids, for proportioning liquids and solids. Our engineers can help you —

Send Coupon

OMEGA MACHINE COMPANY
369 Harris Ave., Providence 1, R. I.

☐ Send Bulletin 45-H8 describing Omega Rotolock Volumetric Feeders.
Our process problem involves:
☐ Waste treatment ☐ Proportioning solids
☐ Proportioning liquids and solids

Name_____
Company_____
Street_____
City_____ State_____

OMEGA
B·I·F INDUSTRIES (Division of B-I-F Industries) OMEGA

CHEMICALS collected by AAF dust collectors

Acid
Acid filtrate
Alkali
Alumina
Alumina hydrate
Aluminum bisulfide
Aluminum catalyst
Aluminum chip
Aluminum nitrate
Aluminum oxide
Aluminum powder
Aluminum silicate
Aluminum silicate, (hydrous)
Ammonia
Ammonium nitrate
Ammonium perchlorate
Ammonium sulfate
Aniline dye
Antimony hydride
Antimony oxide
Barite
Barium carbonate
Barium nitrate
Barium oxide
Barium sulfate
Barium sulfide
Bauxite
Bentonite
Benzene derivatives
Beryllium
Beryllium oxide
Bicarbonate of soda
Bisulfide liquor
Bone
Bone black
Borax
Bronze powder
Calcium aconitate
Calcium carbide
Calcium carbonate
Calcium phosphate
Calcium silicate
Calcium soap
Calcium stearate
Calcium sulfate
Carbide
Carbon
Carbon black
Casein
Cast iron chip
Catalyst, clay
Catalyst, spent oil
Caustics

OPERATIONS controlled by AAF dust collectors

Atomizer
Bagging
Bassins Machine
Breaker
Causticizer tank
Compounding
Conveyor
Conveyor, pneumatic
Cookers
Cooler
Crushe
Elevato
Filling
Filter presses
Furnace, electric
Furnace, heat treating
Furnace, melting
Grinder
Hammer mill
Handling
Hoppers
Kettles
Kettles, Dopp
Kiln
Kiln calcining
Kiln sintering
Loading, bag

CHEMICALS collected by AAF dust collectors

Caustic soda
Cellulose acetate
Charcoal
Chrome ore
Chrome pigment
Chromic acid mists
Citric acid
Clay
Creosote
Cupric oxide
Cyanide fumes
D D T
Defoliant
Detergent
Dextrose
Diatomaceous earth
Dicalcium phosphate
Disinfectant
Dolomite
Dye
Enamel
Fertilizer
Filler material
Fish meal
Fluorescent powder
Fluorspar

It's a Matter of RECORD!

721 AAF Dust Collectors are in Chemical Industry service.
326 chemical plants use AAF Dust Collectors.
69 dust producing operations have been controlled.
196 different chemical dusts are efficiently collected.

You have dust collection problems that are difficult and different! We'd appreciate the opportunity of discussing them with you.

AAF American Air Filter COMPANY, INC.
326 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

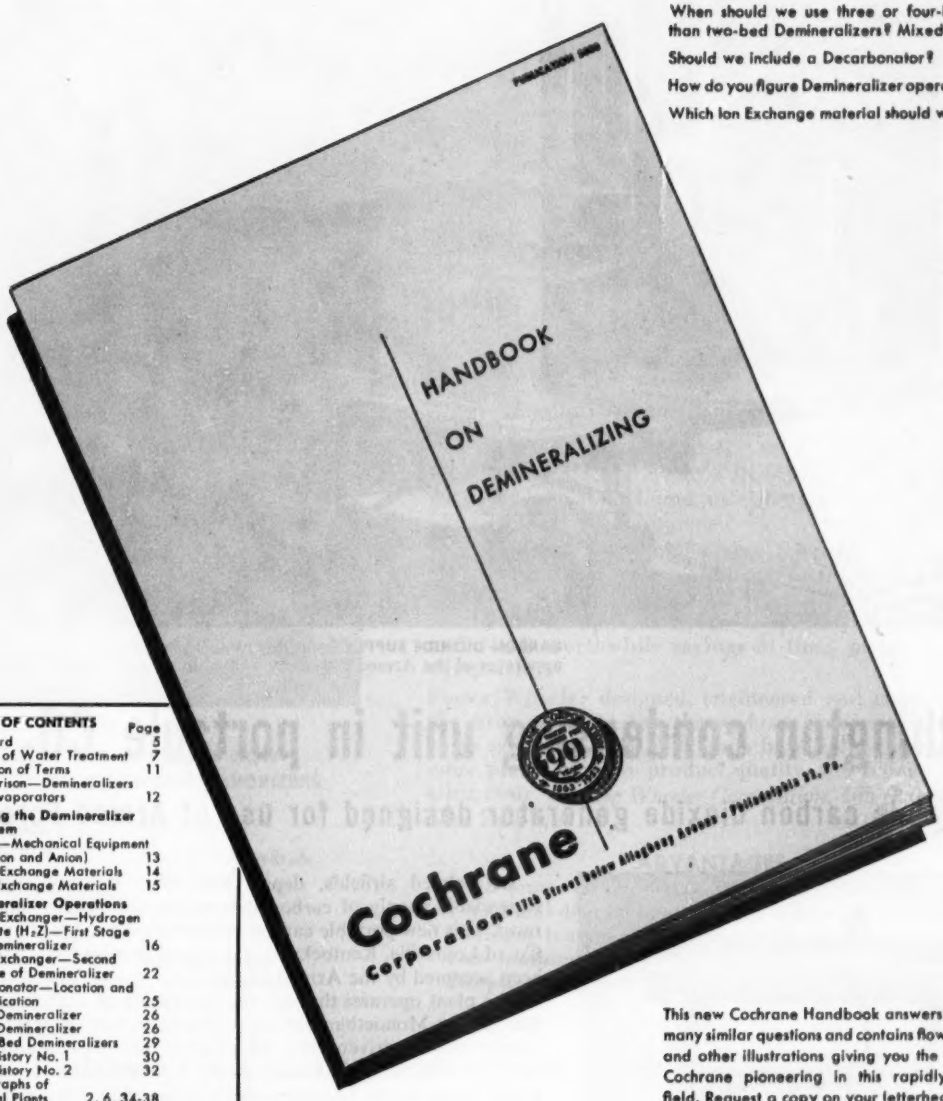
Why is Demineralization being selected instead of Evaporators?

When should we use three or four-bed rather than two-bed Demineralizers? Mixed Bed?

Should we include a Decarbonator?

How do you figure Demineralizer operating costs?

Which Ion Exchange material should we specify?



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This new Cochrane Handbook answers these and many similar questions and contains flow diagrams and other illustrations giving you the benefit of Cochrane pioneering in this rapidly growing field. Request a copy on your letterhead.

COCHRANE CORPORATION WATER ENGINEERS FOR 90 YEARS 1863-1953

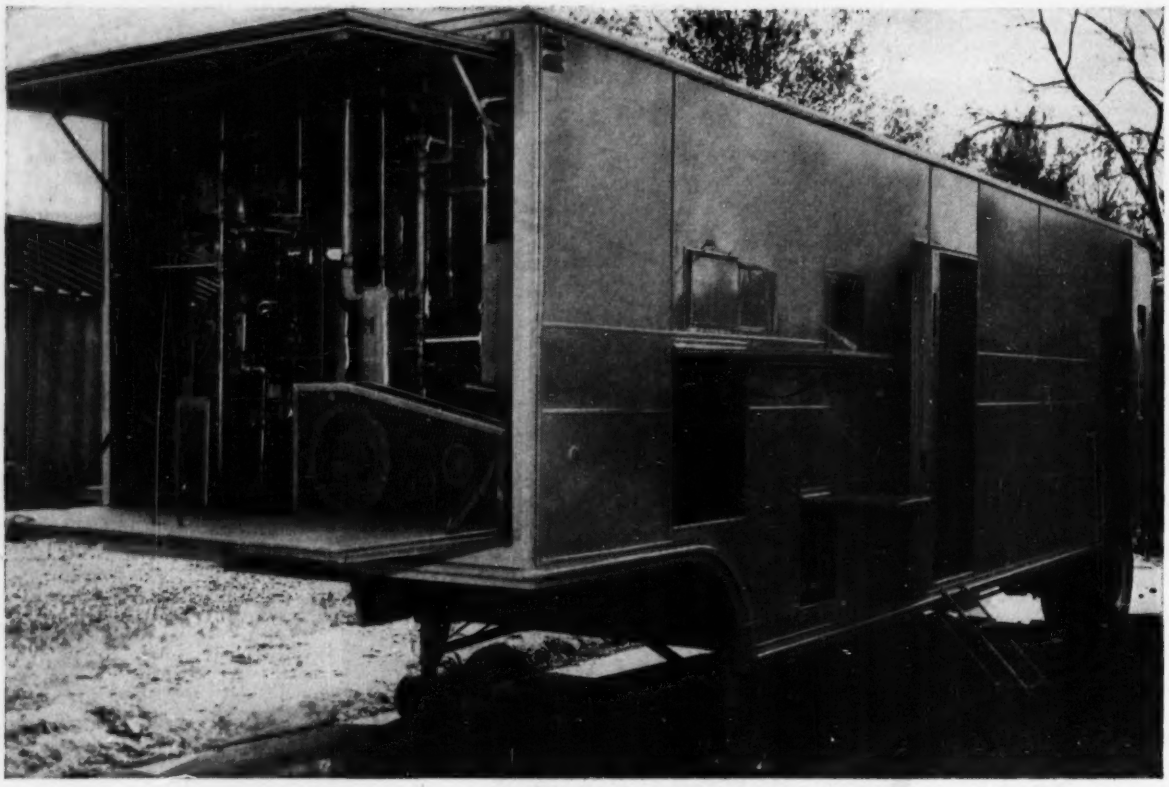
cochrane

corp. *3113 N. 17th Street, Philadelphia 32, Pa.*

offices in 30 principal cities

In Canada: Canadian General Electric Co., Ltd., Toronto
In Mexico: Babcock & Wilcox de Mexico, S.A., Mexico City
In Europe: Recuperation Thermique & Epuration, Paris
In Cuba: Laurence E. Daniel, Inc., Havana
In South America: Servicios Electricos, C.A. (S.E.C.A.) Caracas, Venezuela
In Puerto Rico: F. A. Ortiz & Co., San Juan 5

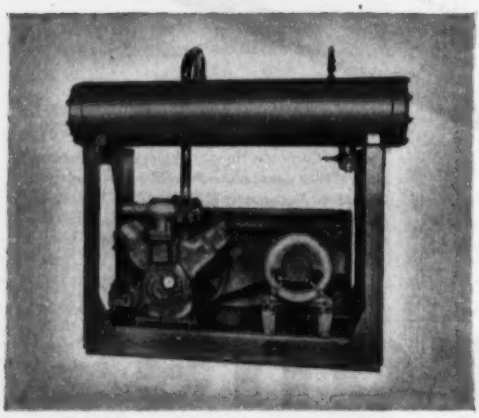
Hot Process Softeners • Deaerators • Dealkalizers • Demineralizers • Reactors • Continuous Blow-Off • Specialties • C-B Systems



CARBON DIOXIDE SUPPLY from this mobile plant finds wide use in fire fighting apparatus of the Armed Forces as well as in numerous industrial applications.

Worthington condensing unit in portable CO_2 plant

Mobile carbon dioxide generator designed for use of Armed Forces



YEAR IN, YEAR OUT — this new Worthington 4JF4 condensing unit delivers peak performance. Its versatility makes it the ideal choice.

At isolated airfields, depots and other military installations, a dependable supply of carbon dioxide for fire fighting apparatus is a must. This new portable carbon dioxide plant produced by the Girdler Co. of Louisville, Kentucky, was designed to meet those needs, and has been accepted by the Armed Forces.

The plant operates through the absorption of carbon dioxide from flue gas by Monoethanolamine — which in turn is regenerated. The carbon dioxide driven off is then cooled, compressed and condensed. And for this vital condensing cycle, a Worthington condensing unit with a 20 hp Freon-12 compressor was specified. The versatility of this rugged and compact unit made it an ideal choice for the job.

For over half a century, Worthington air conditioning and refrigeration equipment has been meeting large and small assignments for the armed forces, business, and industry. Every Worthington unit is not only Worthington-assembled, but more important, Worthington-*made*. You benefit by Worthington's complete unit responsibility:— a good reason to think of Worthington when you think of air conditioning. Get in touch with your nearest Worthington district office, or write Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.4.35, Harrison, New Jersey.

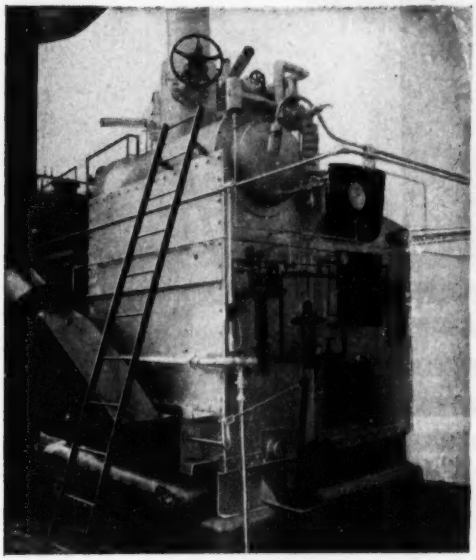
A.4.35

WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME

FRACTIONAL—DEGREE CONTROL

...at high temperatures, low pressures



FOSTER WHEELER
Dowtherm Systems

From the largest: 45 million Btu/hr, 700F, 88 psi
To the smallest: 50 thousand Btu/hr, 650F, 53 psi

In FW indirect low-pressure Dowtherm Systems, process companies have found a simple, economical answer to critical heating problems.

By permitting fractional-degree temperature control, even during rapid process fluctuations, FW Dowtherm helps eliminate both ruined batches and reruns due to uneven temperatures. It simplifies processing — and yields worthwhile savings in time, materials and equipment.

Foster Wheeler designed, engineered and constructed the first complete Dowtherm heat process system 20 years ago. Since then, FW units have helped more and more plants improve product quality, and reduce operating costs. *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

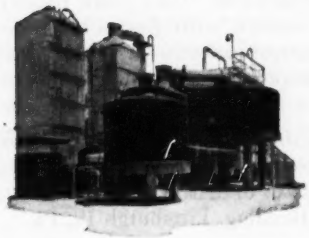
SOME OF THE PROCESSES NOW SERVED BY FW DOWTHERM VAPORIZERS

- Catalyst Heating and Regeneration
- Edible Oil Deodorization
- Esterification
- Fatty Acid Processing
- Oil Bodying
- Phthalic Anhydride Distillation
- Synthetic Resin Manufacturing
- Synthetic Fibre Manufacturing

ADVANTAGES

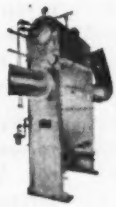
High temperature processing at low pressure
Fractional-degree temperature control
Uniform temperature throughout processing
Low maintenance and repairs
Simplicity of operation

MEETING THE EXACTING NEEDS OF THE PROCESS INDUSTRIES



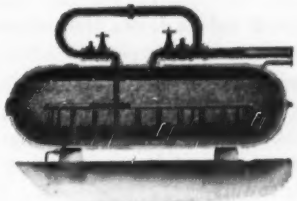
SULFUR RECOVERY EQUIPMENT

Converts H_2S and CS_2 from waste gases into income-producing gases.



WASTE HEAT BOILERS

Help achieve maximum fuel economy and effective temperature control in chemical, oil, paper, metal and many other industries.



STEAM ACCUMULATORS

Automatically store steam to meet peak demands of process plants. Permit operation of boilers at constant, most economical rate.

FOSTER WHEELER

ALCOA Aluminas are remarkably versatile . . . sort of "Jack-of-all-Trades" for process industries. And hard workers they are, too—increasing production, improving quality, reducing costs wherever they're put to work.

CATALYTIC PROCESSES—There are ALCOA Activated and Tabular Aluminas to upgrade your catalytic process yields and reduce losses from contamination and side reactions.

BED-SUPPORTS—If you have a bed-support or cover problem, ALCOA Tabular Alumina Balls are chemically and thermally stable, and catalytically neutral. They offer economy, adaptability and better operation of your reactor towers.

DRYING APPLICATIONS—What do you dry and how dry do you want it? ALCOA Activated Aluminas are the oldest, most thoroughly proved desiccants for the dehydration of liquids, gases and vapors.

REFRACTORIES—What temperature does your process require? Refractories fortified with ALCOA Aluminas withstand the highest temperatures . . . last the longest. And this performance improves as the ALCOA Alumina content increases.

Perhaps one of the ALCOA Aluminas holds the answer to *your* processing problems. Why not find out? Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 702-A Alcoa Building, Pittsburgh 19, Pa.

ALCOA CHEMICALS

ALUMINUM COMPANY OF AMERICA

This Super Stainless Gives You New Freedom From Corrosion!

When you're faced with a severe corrosion problem, investigate the super corrosion resistance of Carpenter Stainless No. 20. This sulphuric acid resisting Stainless can often reduce shutdown time and add substantially to equipment life.

If you are familiar with this alloy in its cast form, known as Durimet 20*, you can appreciate Carpenter No. 20's superior resistance to sulphuric acids, plating and pickling solutions, mixed acids, etc. Now that Carpenter has solved the problem of producing this Stainless in rolled forms such as bars, wire, strip and tubing, the alloy is enabling industry to add months—even years to equipment life.

Many engineers tell us they're planning now to use No. 20 as soon as possible to improve corrosion resistance in their products and reduce shutdowns. For help in your product planning work get the new Carpenter Stainless No. 20 Book. In addition, start now to discover for yourself the far-reaching advantages of No. 20. We'll be glad to provide test coupons and work with your engineering staff. The Carpenter Steel Company, 127 W. Bern St., Reading, Pa.

Export Dept.: The Carpenter Steel Co., Port Washington, N.Y.
"CARSTEELCO"

Imagine What Corrosion Resistance Like This Can Mean To You!

The problem here was to find a material that would stand up in nozzles used to fill storage batteries with electrolyte. Special fixtures were used to handle 12% sulphuric acid (specific gravity 1.080) at temperatures from 70°F to 130°F. Hard rubber nozzles broke frequently—and shutdowns for replacement often ran as high as 30 minutes. Even 18-8 Stainless nozzles, while solving the breakage problem, corroded so badly they lasted only *2 weeks* (see 18-8 nozzle on right of photo). Then Carpenter No. 20 was put to work. After they had been in use for *many months*, nozzles made from No. 20 showed no signs of corrosion (see No. 20 nozzle on left of photo).

*Carpenter Stainless No. 20 is licensed under The Duriron Company, Inc., U.S. Pats. 2,134,670; 2,185,987 and 2,200,208.

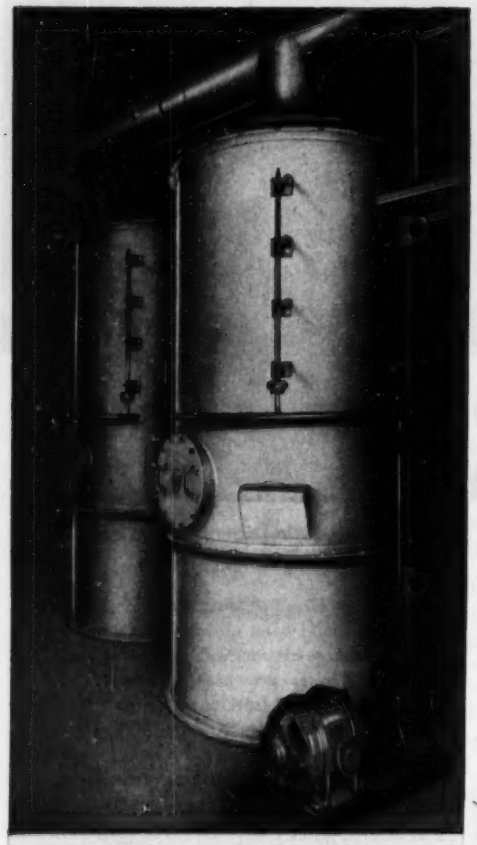
more than corrosion resistance

Carpenter STEEL — **Stainless No. 20**

Pioneering in Improved Tool, Alloy and Stainless Steels Through Continuing Research

DUST and FUME Control

Special equipment engineered to solve individual problems posed by dusts of all kinds, fly ash, chemical fumes, gases of any temperature, aerosols, and other troublesome air polluents



MAHON FOG-FILTERS AT WORK

The installation illustrated above was specially designed for the Motor State Oil & Grease Co., Jackson, Mich. PROBLEM: To eliminate H_2S odor from sulphonated grease manufacturing operations. The problem was complicated by grease and oil fumes present in H_2S gas. SOLUTION: A two-tower Fog-Filter connected in series was designed with high pressure water fog collecting practically all of the grease and oil fumes in the first tower. A caustic solution employed in the second tower and fogged at lower pressure removes the remaining H_2S from the air before it is exhausted into the atmosphere.

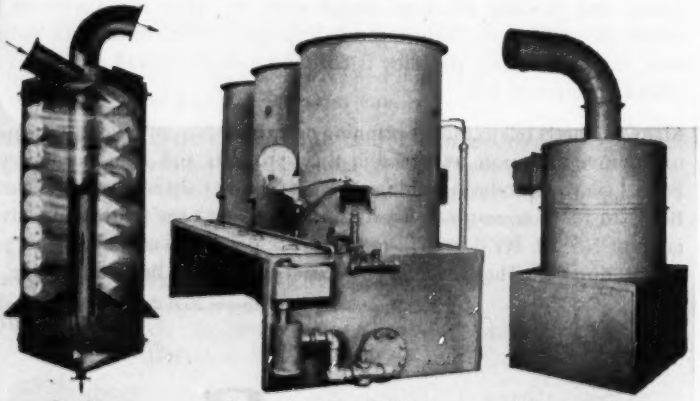
In dealing with air contaminants, each individual air cleaning problem must be approached with a view to determining what type of collector or filter is required to produce maximum results under existing conditions. Study and analysis of the character and extent of the polluent is therefore imperative in arriving at a satisfactory solution. Mahon dust and fume control engineers have, over a period of years, developed and perfected special Wet and Dry Collectors and Fog-Filters which have proved highly successful in coping with all types of industrial air contaminants—a few are illustrated here . . . they are serving today in some of the most difficult and mandatory air cleaning jobs in industry. Each installation has been engineered to do the specific job. If you have an air pollution problem, regardless of its character, it will pay you to call in a Mahon engineer and let him show you what Mahon equipment has done with like polluents under conditions comparable to your own. See Mahon's Insert in Sweet's Mechanical Industries File for further information, or write for Industrial Equipment Catalog A-653.

THE R. C. MAHON COMPANY

Main Plant and Home Office, Detroit 34, Michigan

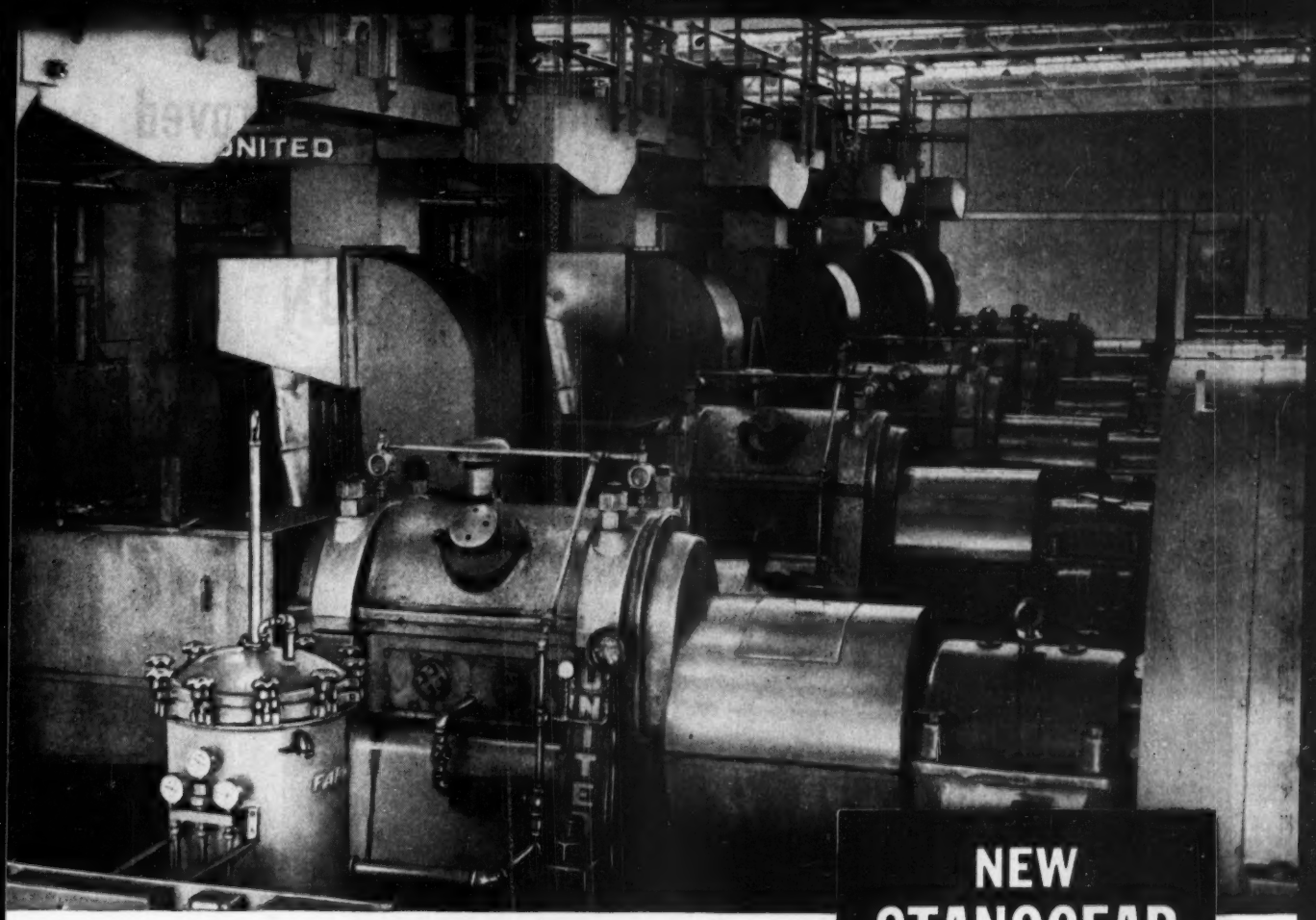
Engineers and Manufacturers of Dust and Fume Control Equipment Including Cyclone Collectors, Hydro-Foam Collectors, Jet Trap Collectors, Hydro-Filter Collectors, and Fog-Filters and Cupola Stack Washers.

All Mahon Equipment is Erected by Mahon to Insure Complete Satisfaction.



Fog-Filter **Hydro-Foam Dust Collector** **Jet Trap Dust Collector**

MAHON



NEW STANOGEAR
REG. U.S. PAT. OFF.
Compounds

NOW . . . 7 ways better for extreme-pressure lubrication . . .

New and improved STANOGEAR Compounds have been developed to meet the requirements of an increasing variety of tougher extreme-pressure lubricating jobs found throughout industry, today. The result of several years of special research and field test work, these outstanding products have proved in actual service their ability to provide these important advantages:

1. Higher load carrying capacity. Use of improved extreme-pressure additives in STANOGEAR Compounds provide a greater anti-weld property. This results in the higher load carrying capacity which these products have demonstrated in actual service.

2. Superior retention of load carrying capacity. In service tests, STANOGEAR Compounds have proved superior to conventional extreme-pressure lubricants in ability to maintain a high load carrying capacity over extended periods of service.

3. Freedom from objectionable deposits. Appropriate base stocks and additives give STANOGEAR Compounds a high resistance to oxidation, thus minimize the formation of deposits.

4. Excellent storage stability. STANOGEAR Compounds contain compounding ingredients which assure excellent stability both in service and storage.

5. Good water separation. STANOGEAR Compounds have demonstrated their superiority to ordinary extreme-pressure lubricants in ability to provide good water separation.

6. Anti-foaming. Under adverse operating conditions, the anti-foam agent in STANOGEAR Compounds has prevented foaming troubles.

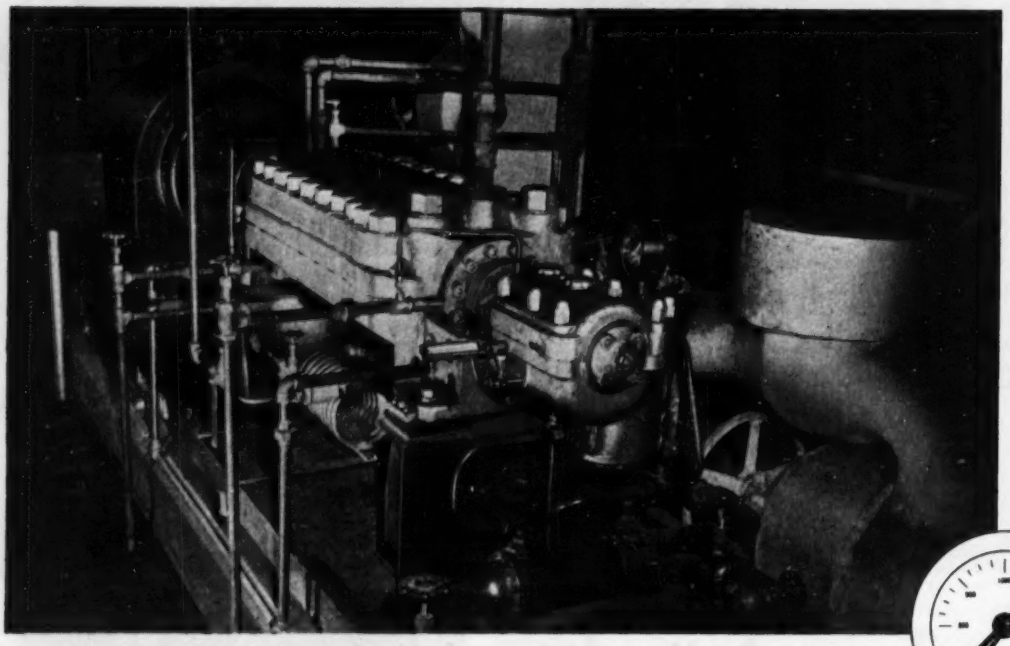
7. Versatility. A unique combination of additives in STANOGEAR Compounds equips these products for various industrial gear applications where extreme-pressure lubricating properties are necessary. To meet varying viscosity requirements, STANOGEAR Compounds are available in eight viscosity grades.

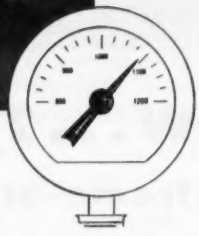
The Standard lubrication specialist in your area of the Midwest will be glad to give you more information about the new STANOGEAR Compounds. You need only phone your local Standard Oil office. Or write: Standard Oil Co., 910 South Michigan Avenue, Chicago 80, Illinois

STANDARD OIL COMPANY STANDARD *(Indiana)*

Modern design boiler-feed pumps, service-proved

AT ALCOA REFINING DIVISION





Ingersoll-Rand Class HMTA pumps aid in production of alumina, preparatory material for vital aluminum

One of two 3" HMTA pumps on 1095 psi boiler feed service at this company's East St. Louis plant.

This important ALCOA division refines bauxite ore into alumina to help keep ALCOA production facilities going full-tilt. This East St. Louis plant also produces some 50 other chemicals that are widely used throughout the country.

Aluminum Company of America's East St. Louis Works generates its total power requirements in its own powerhouse. Two Ingersoll-Rand 8-stage Class HMTA pumps are on boiler feed service there, delivering 300 gpm of 345° feed water at 1095 psi. When installed in 1951, these pumps were among the first of their type to go into service. Performance records since start-up indicate the reliability of their modern, "Unit-Type Rotor" design, pioneered by Ingersoll-Rand.

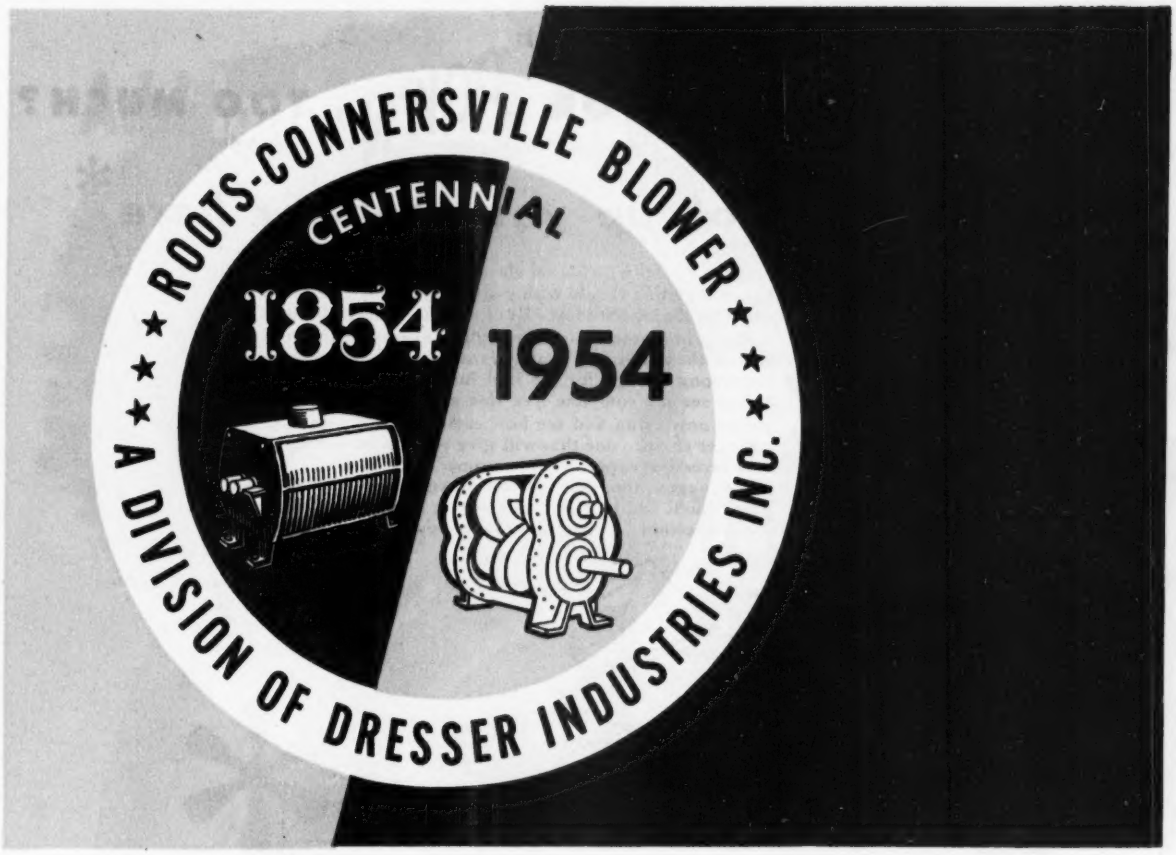
There's an I-R pump for every application, every pressure... backed by over 90 years of service to industry. Call on your nearest Ingersoll-Rand branch office for help with *your* pumping problems.

For more information on Class HMTA pumps, write for Catalog 7233.

Ingersoll-Rand
11 Broadway, New York 4, N. Y.

828-10

CONDENSERS • GAS AND DIESEL ENGINES • TURBO-BLOWERS • ROCK DRILLS • COMPRESSORS • AIR AND ELECTRIC TOOLS



Air-handling specialists for 100 years

Starting in 1854 with the invention of the Rotary Positive Blower by our founder, Francis M. Roots, our company's services to industry were, for many years, devoted exclusively to air-handling problems.

As industry developed new applications of gases for fuels and chemicals, it was a natural step for us to move into this field because the general principles of moving and measuring air and gas are so closely similar.

Thus, Roots-Connersville service has been widened to include seven basic types of equipment for handling gas or air. The most recent development has been the new Spiraxial Compressor, first marketed in 1953.

So, for a century we have been engaged exclusively as specialists in handling gas and air. That is our only business. We like to think that this is one of the important reasons why Roots-Connersville equipment has been so widely accepted and has proved so satisfactory in every industry where processing involves the movement of air or gas.

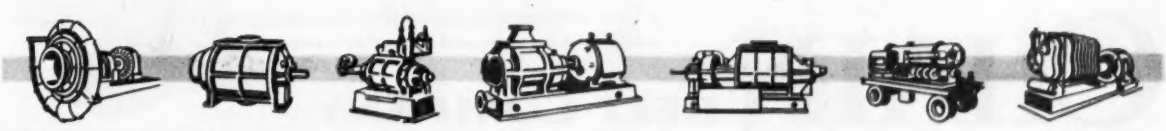
The growth which we have experienced over 100 years could not have been possible without the loyal support of our many thousands of customers. We thank them for this evidence of good will—and we offer the same high type of equipment and service to any industry that has a problem of moving gas or air.

ROOTS-CONNERSVILLE BLOWER

Reg. U.S. Pat. Off.

BLOWER BUILDERS SINCE 1854

A DIVISION OF DRESSER INDUSTRIES, INC.
154 Illinois Ave. • Connersville, Indiana



Centrifugal and Rotary Positive Blowers and Exhausters • Positive Displacement Meters • Vacuum Pumps • Gas Pumps • Inert Gas Generators • Spiraxial Compressors

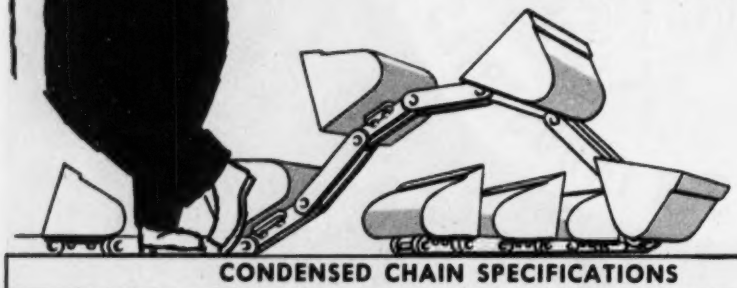
ELEVATOR "DOWN" TOO MUCH?

Look up your answer here*

Having trouble with bucket elevator chains? Here's a good way to avoid getting caught with your "plants down." Use the right chain for the job. Not just a Rex Chain BUT the right Rex Chain.

It's an important point to consider because chain breakage is seldom the fault of the chain. It could be that it's misapplied... not strong enough for the job! Just take a look at the table. You'll see the complete Rex line at a glance. Find the chain you're now using and see how easily you can move up into a stronger chain...one that will give you longer service...eliminate excessive, expensive down time.

We suggest, too, that you consult your Rex Field Sales Engineer. You'll find he's able to give you a lot of valuable help in chain selection...help that will save you plenty.



CONDENSED CHAIN SPECIFICATIONS

If You Are Using	And Want a Stronger Chain, We Recommend	Use Same Sprkts.	New Sprkts. Req'd.
†823	825		√
131	S131	√	
S131	S825		√
†825	S825	√	
S825	S102½		√
†830	S830	√	
S830	S844		√
A102B	S102B	√	
S102B	S102½		√
110	S110	√	
S110	S844		√
A102½	S102½	√	
S102½	S111		√
A111	S111	√	
S111	S844		√
†844	S844	√	
S844	S856		√
A132	SA150	√	

*Can also be shipped in Rex Z-Metal which is approximately 25% stronger; furnished with heat treated pins.

†Can also be furnished with alloy pins and manganese bushings.

Chain No.	Pitch	Working Load	Ultimate Strength
*†823 Ley Bushed	4.000	3,150	19,000
*131 Combination	3.075	3,200	24,000
S131 Chabelco	3.075	4,450	40,000
*†825 Ley Bushed	4.000	5,000	30,000
S825 Chabelco	4.000	6,000	50,000
*†830 Ley Bushed	6.000	5,000	30,000
S830 Chabelco	6.000	6,000	50,000
*A102B Durobar	4.000	4,000	24,000
S102B Chabelco	4.000	6,300	40,000
*110 Combination	6.000	4,000	24,000
S110 Chabelco	6.000	6,300	40,000
*A102½ Durobar	4.040	5,600	36,000
S102½ Chabelco	4.040	7,800	50,000
*A111 Durobar	4.760	6,000	36,000
S111 Chabelco	4.760	8,400	50,000
*†844 Ley Bushed	6.000	6,650	40,000
S844 Chabelco	6.000	9,200	70,000
*A132 Durobar	6.050	8,400	50,000
SA150 Chabelco	6.050	15,000	100,000
S856 Chabelco	6.000	14,000	100,000

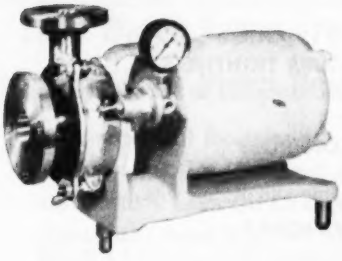
Get the full story on how the complete line of Rex Chains can help you get the most out of your elevating, conveying and power transmission equipment. Write for Bulletin 52-53 today or call your nearest Rex Field Sales Engineer. Chain Belt Company, 4648 W. Greenfield Ave., Milwaukee, Wis.

CHAIN BELT COMPANY

Shafer Roller Bearings—self-aligning, carry the big loads, saving money and power. Available in pillow blocks, flange units, take-up units and five other types.

Add longer life and greater economy to your processing lines...

with TRI-CLOVER WELDING FITTINGS



For top quality Centrifugal Pumps . . . be sure to investigate the many advantages offered through the use of Tri-Clover corrosion-resistant industrial pumps for an extremely wide range of applications. For complete details, write for new Catalog 253.

• Tri-Clover Butt Welding Fittings in Stainless Steel Type 304, 347, 316 and other analyses, are custom fabricated from highest quality materials by skilled craftsmen backed by years of specialized experience. Because of this quality, plus full corrosion resistance and longer life, the end result is greater economy in process line service.

Tri-Clover Zephyrweld® lightweight welding fittings are made in tube O.D. sizes from ½" through 24" and 36". Those through 4" are annealed, pickled and passivated. Larger sizes are annealed, and are passivated on request. Available in all standard fitting types.

Tri-Clover Schedule 5 and 10 welding fittings are made in a full line, for use with light gauge *pipe* in sizes from ½" through 24" and 36".

Schedule 40 welding fittings are available in sizes from ½" through 12". Information on request.

For stainless steel welding fittings for every process need, be sure to specify TRI-CLOVER.

See your nearest TRI-CLOVER DISTRIBUTOR

EXPORT DIVISION:
8 So. Michigan, CHICAGO, U.S.A.
Cable: TRICLO, CHICAGO

Tri-Clover®
MACHINE CO.
Kenosha, Wisconsin

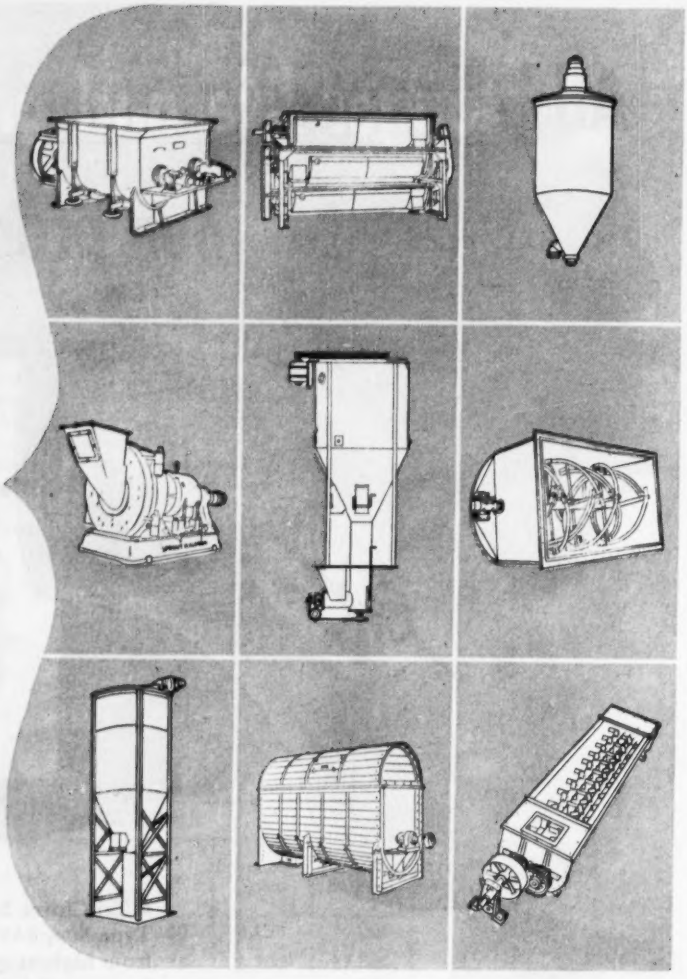
TRIALLOY AND STAINLESS STEEL SANITARY FITTINGS, VALVES, PUMPS, TUBING, SPECIALTIES

FABRICATED STAINLESS STEEL INDUSTRIAL FITTINGS AND INDUSTRIAL PUMPS

THE Complete LINE

I-154

what's most important to you in **MIXERS**?



FLOOR SPACE?
If limited space is your problem, Sprout-Waldron may have the answer. We have mixers so compact that one with 1250 cu. ft. capacity occupies only 90 sq. ft. of floor space.

POWER?
You can save power with Sprout-Waldron mixers—verticals in sizes up to 1500 cu. ft. operate with as little as 30 h. p.

CORROSION RESISTANCE—MATERIALS CONTAMINATION?
You can get a Sprout-Waldron made of wood, stainless steel, black iron, non-ferrous or commercial alloys engineered to meet your specific needs.

SELF-CLEANING?
Sprout-Waldron verticals are naturally self-cleaning, and horizontals can be made nearly so.

MIXING TIME?
Certain Sprout-Waldron models produce complete mixes in seconds after being charged with the last ingredient.

EASE OF CHARGING?
Some Sprout-Waldron mixers are self-contained—equipped with their own loading or charging means.

DISCHARGE EFFICIENCY?
Sprout-Waldron mixers can dump entire charge in one mass with properly designed discharge gates.

INTIMATE BLENDING?
With a Sprout-Waldron blender, particles can be made to lose their individual identities.

DUST AND PRESSURE TIGHTNESS?
All Sprout-Waldron models can be made dust-tight and pressure-tight.

TEMPERATURE CONTROL?
At Sprout-Waldron there is the know-how to incorporate heating, cooling and drying with mixing.

VISCOSITY PROVISIONS?
Sprout-Waldron equipment mixes dry and semi-dry materials, adds liquids to solids, and even mixes molasses in January.

Whatever your mixing requirements, Sprout-Waldron meets them with dependable guidance, unique *"adaptioneering"* methods, a complete line of equipment, and top-notch service. You get more at Sprout-Waldron, because Sprout-Waldron has more to give. Let us advise you on your next mixer installation without cost or obligation. *Please write for details.*

YOUR INVESTMENT PROTECTED
Our 88 years of service to industry is good assurance that you can obtain parts and service for the life of your Sprout-Waldron equipment.

SPROUT-WALDRON
Manufacturing Engineers Since 1866
Equipment for SIZE REDUCTION • MIXING & BLENDING • BULK MATERIALS HANDLING • PELLETING & CUBING • PRODUCT CLASSIFICATION
Facilities for fabricating, machining, custom founding, woodworking, laboratory testing
15 LOGAN STREET • MUNCY, PA.

325

want a HIGH VACUUM rotary pump that pumps WATER VAPOR?

Here's the NEW GAS BALLAST PUMP backed by MILLIONS OF HOURS of trouble-free operation

Ends Water Vapor Trouble
Maintains Fast Pump Down Time

Eliminates Oil Reclaiming
Greater Capacity Under 1 mm Hg
Up To 80% Less Oil Charge
Capacities from 1¼ cfm to 400 cfm
Pressures Down To 10^{-5} mm Hg

Here's important news for everyone who works with high vacuum. The new NRC Rotary Gas Ballast Pump gets it for you faster — saves you time and money and is backed by millions of hours of trouble-free operation.

By keeping water vapor from condensing, this pump prevents contamination of the pump oil. The result—it never loses capacity like conventional rotary pumps when pumping condensable vapors. It continually maintains a fast pump down rate.

NRC Rotary Gas Ballast Pumps are available in a complete line of vane, piston-type and 2-stage pumps.

Send today for new bulletin explaining principle, construction and operation data on the NRC Rotary Gas Ballast Pump.

NRC National Research Corporation
Equipment Division
Seventy Memorial Drive, Cambridge, Massachusetts

DARCO Digest

DARCO DEPARTMENT • ATLAS POWDER COMPANY
Darco General Sales Offices—60 EAST 42nd STREET, NEW YORK 17, N. Y.
ATLAS POWDER COMPANY, CANADA, LTD., BRANTFORD, CANADA

Why and How to Use DARCO to eliminate foaming

The tendency of various solutions to foam excessively—even to the extent of interfering with process operation—can be materially reduced by treatment with Darco activated carbon. The reason that carbon proves so effective for this application is that foam is caused by a surface active material present in the solution. Surfactants tend to move to any interface that may be present, and activated carbon presents an ample supply of interface.

For this reason, surface active agents are one of the several classes of materials which are readily adsorbed from solution by activated carbon. It should be emphasized that foaming agents are *removed* by the carbon treatment. In this respect this method of foam control is distinctly different from the addition of a foam reducing material to the solution. Because the Darco method works by subtraction, it is particularly applicable to solutions where you don't want to add further impurities to combat the impurities that are already present.

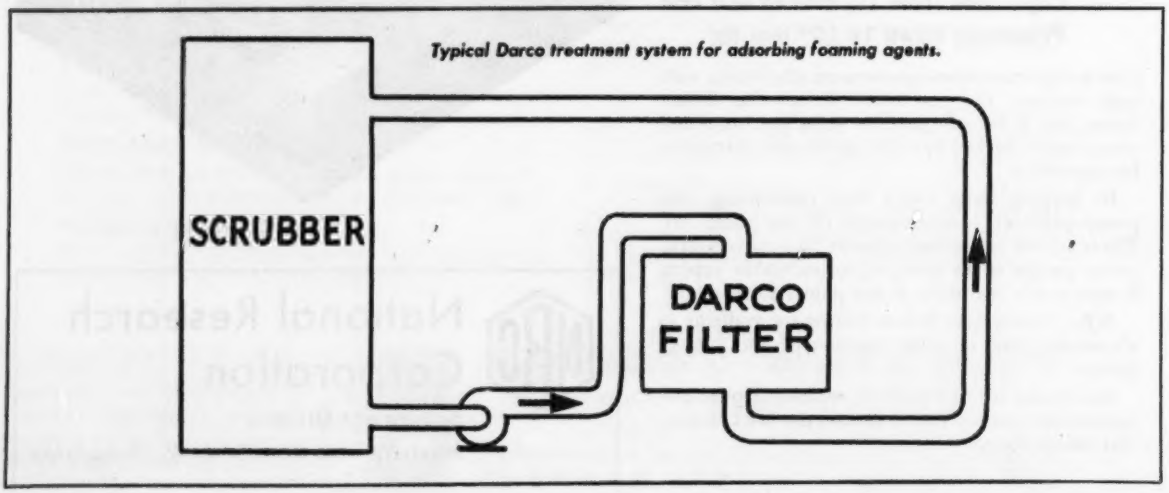
A typical example of how Darco helps eliminate foaming occurs in the production of butadiene for synthetic rubbers. During processing, these materials are scrubbed with an ammoniacal copper solution. The solution, however, develops foam after extended use; and the foam impairs the cleaning action. By periodically running the solution through a bed of Darco, the foam-causing agents are readily removed and the solution is restored to original condition.

Darco specialists will be glad to recommend ways that you can utilize this effective means of solving your specific foam control problems.

Food Acids Decolorized with DARCO

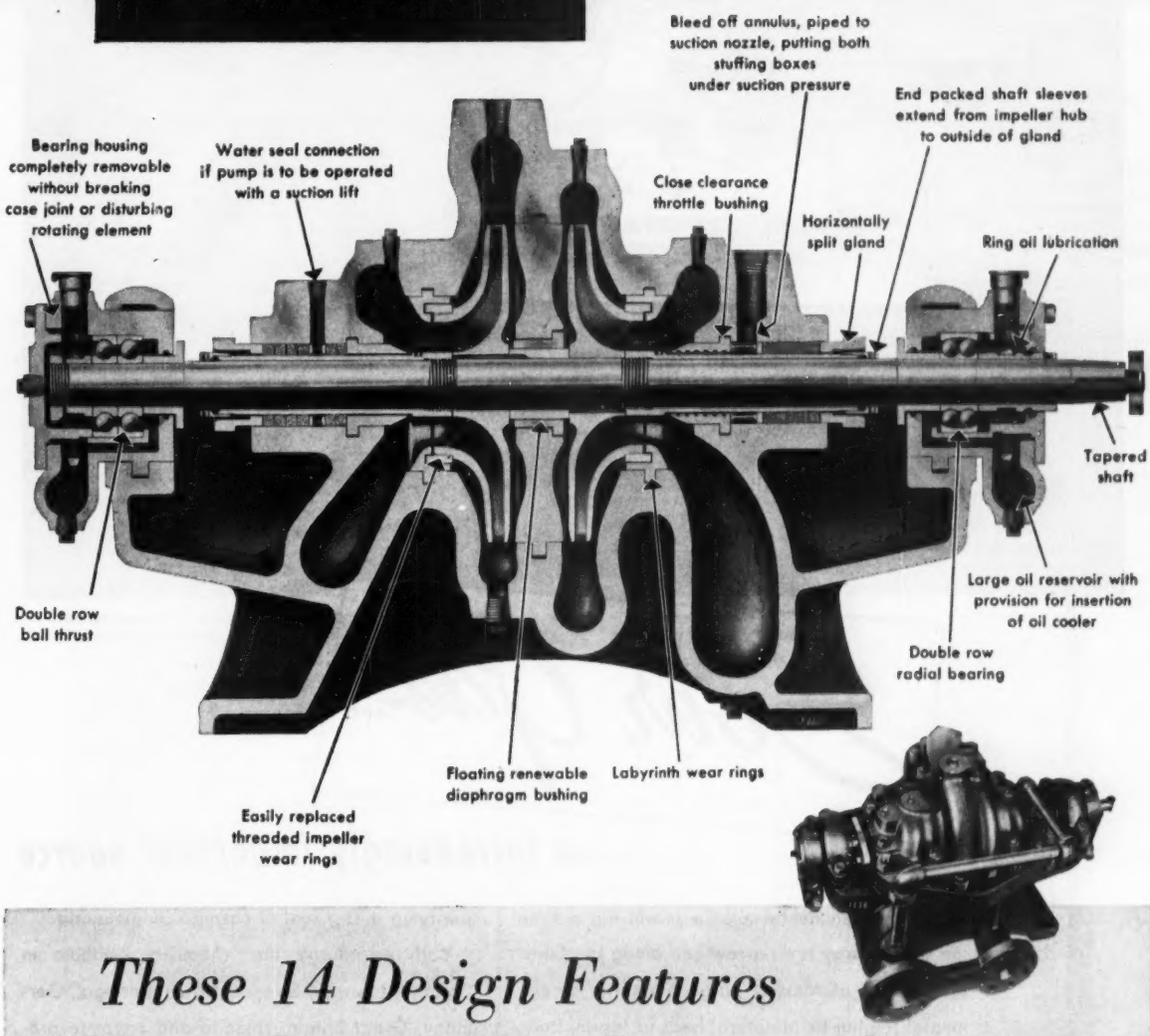
Citric, lactic, phosphoric, acetic and other acids are added to food products to lend tartness often desirable in the food flavor. Decolorizing these acids to pure whiteness, by treatment with Darco activated carbon, helps to give them a strong competitive advantage, and improves customer acceptance.

On citric and phosphoric acids Darco S-51 does an excellent decolorizing job. On lactic acid Darco G-60 is preferred, whereas on acetic acid (vinegar) Darco KB is outstanding. Why not one Darco grade for all organic acids? Because each one presents an individual problem, which our carbon-wise technical staff helped to solve.



Typical Darco treatment system for adsorbing foaming agents.

DE LAVAL
TWO-STAGE
HORIZONTAL PUMPS


Bleed off annulus, piped to suction nozzle, putting both stuffing boxes under suction pressure
End packed shaft sleeves extend from impeller hub to outside of gland
Bearing housing completely removable without breaking case joint or disturbing rotating element
Water seal connection if pump is to be operated with a suction lift
Close clearance throttle bushing
Horizontally split gland
Ring oil lubrication
Tapered shaft
Double row ball thrust
Large oil reservoir with provision for insertion of oil cooler
Double row radial bearing
Floating renewable diaphragm bushing
Labyrinth wear rings
Easily replaced threaded impeller wear rings

These 14 Design Features Insure Long-range, Low-cost Service

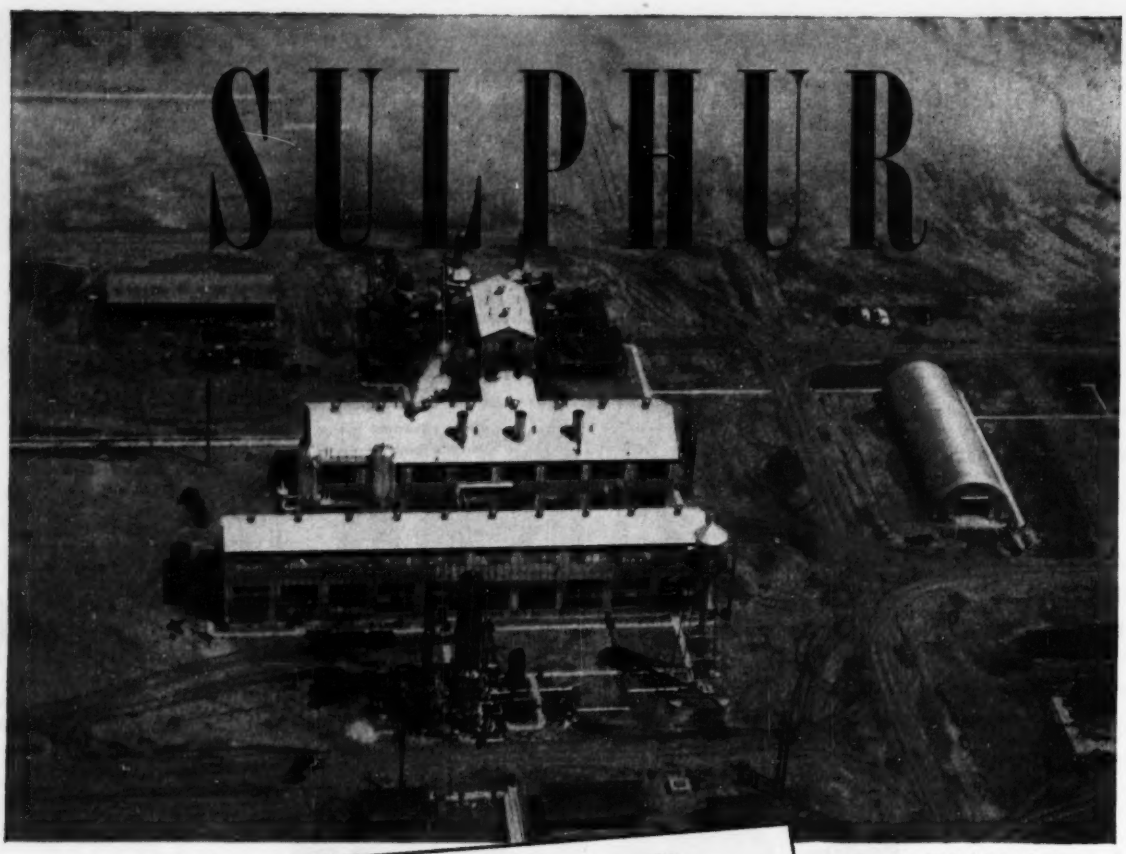
Look at the important design features highlighted in this cross-section. You will clearly see why De Laval 2IS-2KS Two-Stage Horizontal Pumps are designed to give you long, dependable, highly efficient service. ● These pumps are precision-made to quality manufacturing standards. They are available in capacities from 75 to 3,000 gpm, sizes from 2″ to 8″ discharge and heads to 750 feet. Write for Bulletin 1501 giving complete data.

DE LAVAL *Centrifugal Pumps*

DE LAVAL STEAM TURBINE COMPANY

Nottingham Way, Trenton 2, New Jersey

DL-223



Sour Gas (H_2S) Sulphur Recovery Plant, Worland, Wyoming.

Sour Gas...

...an increasingly important source

The largest elemental sulphur producing area in the world today is a narrow belt along the Coast of the Gulf of Mexico. Large quantities of elemental sulphur lie in natural beds in Japan, Italy, the Andes Mountains of South America, as well as many other sections of the world.

Most of the natural gas coming from fields on the East slope of the Rocky Mountains contains hydrogen sulphide rendering the gas "sour." The recovery of the sulphur from this gas, thereby purifying it, is a feat of chemical engineering.

Both metallurgy and chemistry combine in Canada, Norway, Sweden, Spain, Portugal, Germany, Great Britain, Holland and Egypt to produce substantial quantities of elemental sulphur from sulphides of hydrogen, iron and oil shale.

This company has the largest single unit in the world at Worland, Wyoming, recovering elemental sulphur from hydrogen sulphide contained in sour gas.

Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N. Y.

Sulphur Producing Units

- **NEWGULF, TEXAS**
- **MOSS BLUFF, TEXAS**
- **SPINDLETOP, TEXAS**
- **WORLAND, WYOMING**

How to Select the Best Ion Exchangers

FOR YOUR SPECIFIC APPLICATIONS

Permutit Ion Exchangers and Equipment are now being used successfully in copper and zinc recovery from textile wastes, metal recovery from plating wastes, and in sugar, chemical and antibiotic manufacture, as well as many other fields.

New uses that have profit-producing possibilities for your own processes include:

REMOVAL of impurities from solutions

CONCENTRATION for profitable recovery

SEPARATION of substances from each other

SUBSTITUTION of specific ions for others in solution

CATALYSIS of chemical reactions

To select the best cation or anion exchangers for your specific purpose, examine the table below. The Permutit Company will be pleased to furnish further information on both the application and the ion exchangers most suitable—along with samples for your experimental work. Write today.

The Permutit Company, Dept. CE-1, 330 West 42nd Street, New York 36, N. Y. or Permutit Company of Canada, Ltd. 6975 Jeanne Mance Street, Montreal.

	CATION EXCHANGERS				ANION EXCHANGERS				
	Zeo-Dur*	Decalso*	Zeo-Karb*	Permutit Q	De-Acidite*	Permutit W	Permutit A	Permutit S-1	Permutit S-2
Chemical Stability to acids			x	x	x	x	x	x	x
to alkalies				x	x	x	x	x	x
to oxidation				x		x		x	x
to temperature				x		x		x	
to organic solvents	x	x		x		x	x	x	x
Physical stability	x	x	x	x	x	x	x	x	x
For removal of weak acids							x	x	x
For removal of strong acids					x	x	x		
For high regeneration efficiency			x	x	x	x			x
For high capacity		x		x	x		x		x
For low initial exchanger cost	x	x	x		x		x		
pH range (operating)	6.2-8.7	6.9-7.9	0-11	0-13	0-12	0-13.9	0-13.9	0-13.9	0-13.9
For high porosity		x	x		x				
For hydrogen exchange low pH			x	x					
For salt splitting							x	x	x

x = generally recommended

*Registered trade marks

MANUFACTURER OF ION EXCHANGERS AND EQUIPMENT FOR OVER 40 YEARS

PERMUTIT

HANCOCK

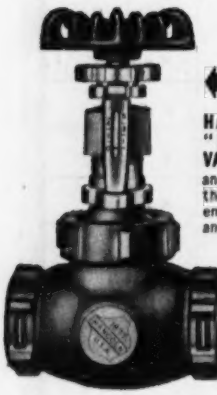
"FLOCONTROL" VALVES GIVE YOU PIN/POINT CONTROL

Here's manual control of flow, temperature and pressure that's really precise. Hancock "Flocontrol" Valves, with micrometer dial and pointer mounted on the bonnet, permit settings to within 1/100th turn of the handwheel! Equally important, any setting can be duplicated easily, perfectly — any time.

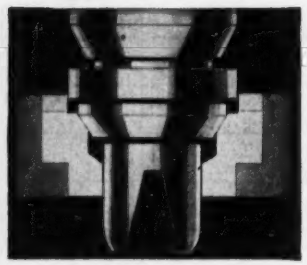
Hancock "Flocontrol" "3 in 1" design gives you the advantages of a variable orifice, plus a shut-off, plus an index... all in "one package." Bronze and steel types are available. Both have a scientifically designed V-Port valve disc that *compels proportional flow throughout the entire lift of the valve stem.* The shut-off seating surface is entirely removed and separate from the controlling V-Ports. Super-finished "500 Brinell" stainless steel seats and discs minimize the effects of wire-drawing and steam cutting.

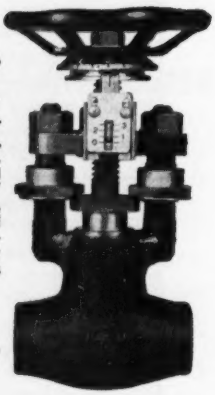
For fine throttling control and proportional flow... for greatest efficiency, lowest operating costs — install strong, dependable Hancock "Flocontrol" Valves in your lines. Your nearby Hancock Distributor will gladly give you full details.

When Hancocks go in, valve costs go down



HANCOCK BRONZE "FLOCONTROL" VALVES. Types: Globe and Angle. Sizes: ¼" through 2". Screwed ends. Available in 150# and 300# Series.





HANCOCK 600# STEEL "FLOCONTROL" WELDVALVES. Types: Globe and Angle. Outside Screw and Yoke. Sizes: ¼" through 4". Screwed, Socket Welding and Flanged Ends. Available with 150#, 300# and 600# Series Flanges.

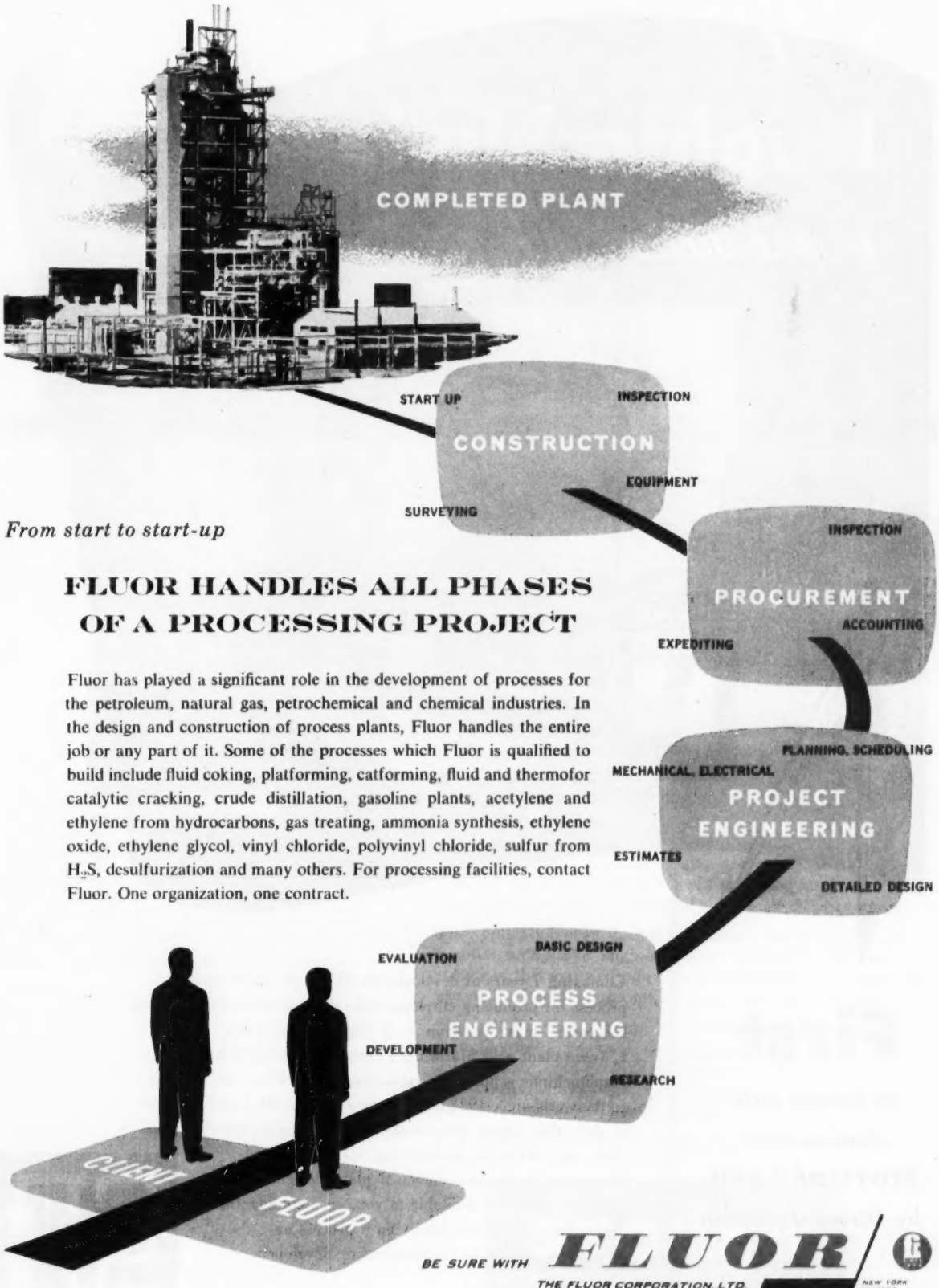
VALVE SEAT AND V-PORT DISC fully closed. As the valve is opened proportional flow is gradually increased. The Hancock "Flocontrol" Valve has straight-line flow. Its regulation does not depend on the short-wearing, fine threads common to a needle valve.

YOUR LOCAL INDUSTRIAL SUPPLY DISTRIBUTOR is as close as your nearest telephone. His 24-hour emergency service and large stocks of the finest supply items simplify your purchasing and save money for you.

HANCOCK VALVES

A product of **MANNING, MAXWELL & MOORE, INC.** Watertown 72, Massachusetts

MAKERS OF 'HANCOCK' VALVES, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN' INDUSTRIAL INSTRUMENTS, AIRCRAFT PRODUCTS. BUILDERS OF "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.



From start to start-up

FLUOR HANDLES ALL PHASES OF A PROCESSING PROJECT

Fluor has played a significant role in the development of processes for the petroleum, natural gas, petrochemical and chemical industries. In the design and construction of process plants, Fluor handles the entire job or any part of it. Some of the processes which Fluor is qualified to build include fluid coking, platforming, catforming, fluid and thermofor catalytic cracking, crude distillation, gasoline plants, acetylene and ethylene from hydrocarbons, gas treating, ammonia synthesis, ethylene oxide, ethylene glycol, vinyl chloride, polyvinyl chloride, sulfur from H_2S, desulfurization and many others. For processing facilities, contact Fluor. One organization, one contract.

BE SURE WITH **FLUOR**

THE FLUOR CORPORATION, LTD.
LOS ANGELES 22, CALIFORNIA

FOREIGN: FACTS FLUOR - PARIS
FLUOR OF CANADA - TORONTO
FLUOR INTERNATIONAL - BEIRUT
FLUOR PERUANA, S.A. - LIMA
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ENGINEERS
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MANUFACTURERS

NEW YORK
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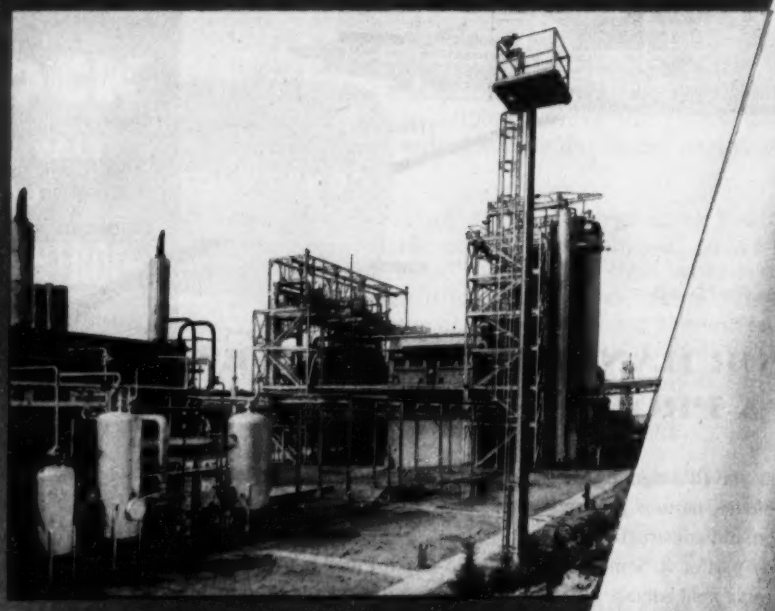
PITTSBURGH
SAN FRANCISCO
HOUSTON
BIRMINGHAM
TULSA

Naphtachimie

in production with new SD *process*



First

in Europe with Commercial

ETHYLENE OXIDE

by Direct Oxidation

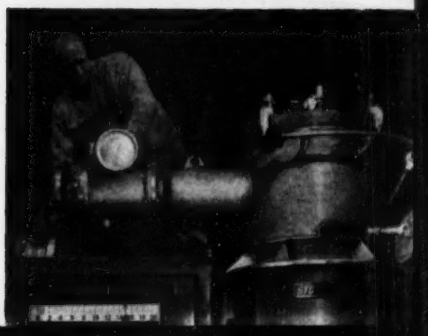
Climaxing 7 years of development, SD's new direct oxidation process for producing ethylene oxide at low cost has now reached successful initial operation . . . at Naphtachimie's new L'Avera plant near Marseille, France, also designed by SD. Naphtachimie is not only first in Europe, but first new producer in the world since 1938 to use such a process. And performance to date, they report, has actually exceeded design specifications. You, too, will profit by utilizing SD's specialized experience in organic chemical plant design. Their services are available to you, on a confidential basis, on any problem involving a process of your own, or one to be procured or developed.

SCIENTIFIC DESIGN COMPANY, INC.

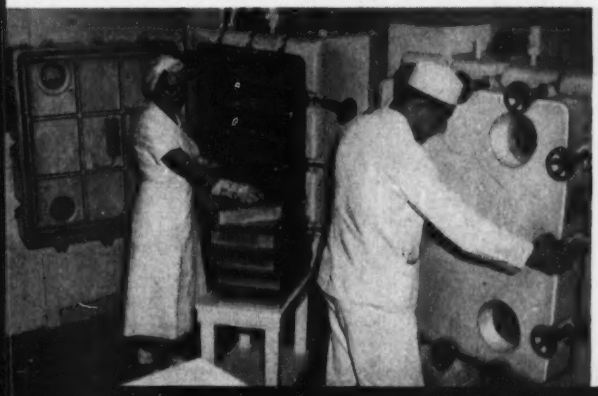
EXECUTIVE OFFICES: 2 PARK AVE., NEW YORK 16, N. Y.

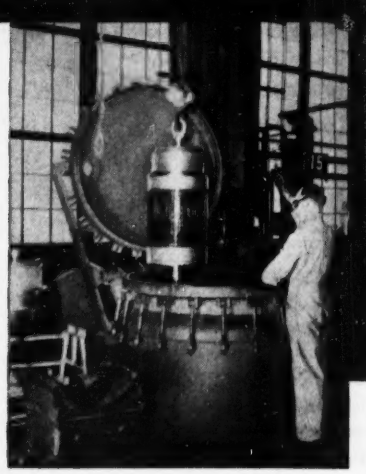
Engineering Offices: Jersey City, New Jersey

Operator transfers evacuated retort from heating to cooling station of Stokes Vacuum Annealing Furnace, designed and built for the processing, annealing and other heat treatment of titanium, zirconium, hafnium, copper and other metals.



One of the uses for the complete custom-built installation of Stokes vacuum freeze-drying equipment in Pitman-Moore Company's new million-dollar plant at Indianapolis, Ind. is to produce gamma globulin to combat poliomyelitis. One of the steps is drying the material from its frozen state. Operators are shown removing trays of gamma globulin from Stokes freeze-dryers. Temperatures are as low as 40° below zero F. during part of the freeze-drying cycle.





Diesel locomotive armature being removed, after impregnation, from Stokes high vacuum impregnating tank in the San Bernardino, Calif., plant of Atchison, Topeka & Santa Fe Railway. Electric motors for the Santa Fe's "Chief" and "Super Chief" develop such excessive heat that ordinary insulation would swell or burst, causing the rotors to "freeze" in the mounting. By impregnating these rotors with protective resins under high vacuum in Stokes impregnators, each turn of wire is held in place, motors operate without interruption.

Installation of Stokes Rotary Vacuum Dryers used by Metals Disintegrating Co., Berkeley, California, for drying of aluminum powder. Highly oxidizable materials can be handled without any danger of combustion or explosion when they are processed under vacuum.

Vacuum at Work

Diesel locomotive motors, paper and metals, medicines, electrical parts, toys . . . are but a few in a wide range of products which are processed in vacuum for the good of mankind and the profit of business.

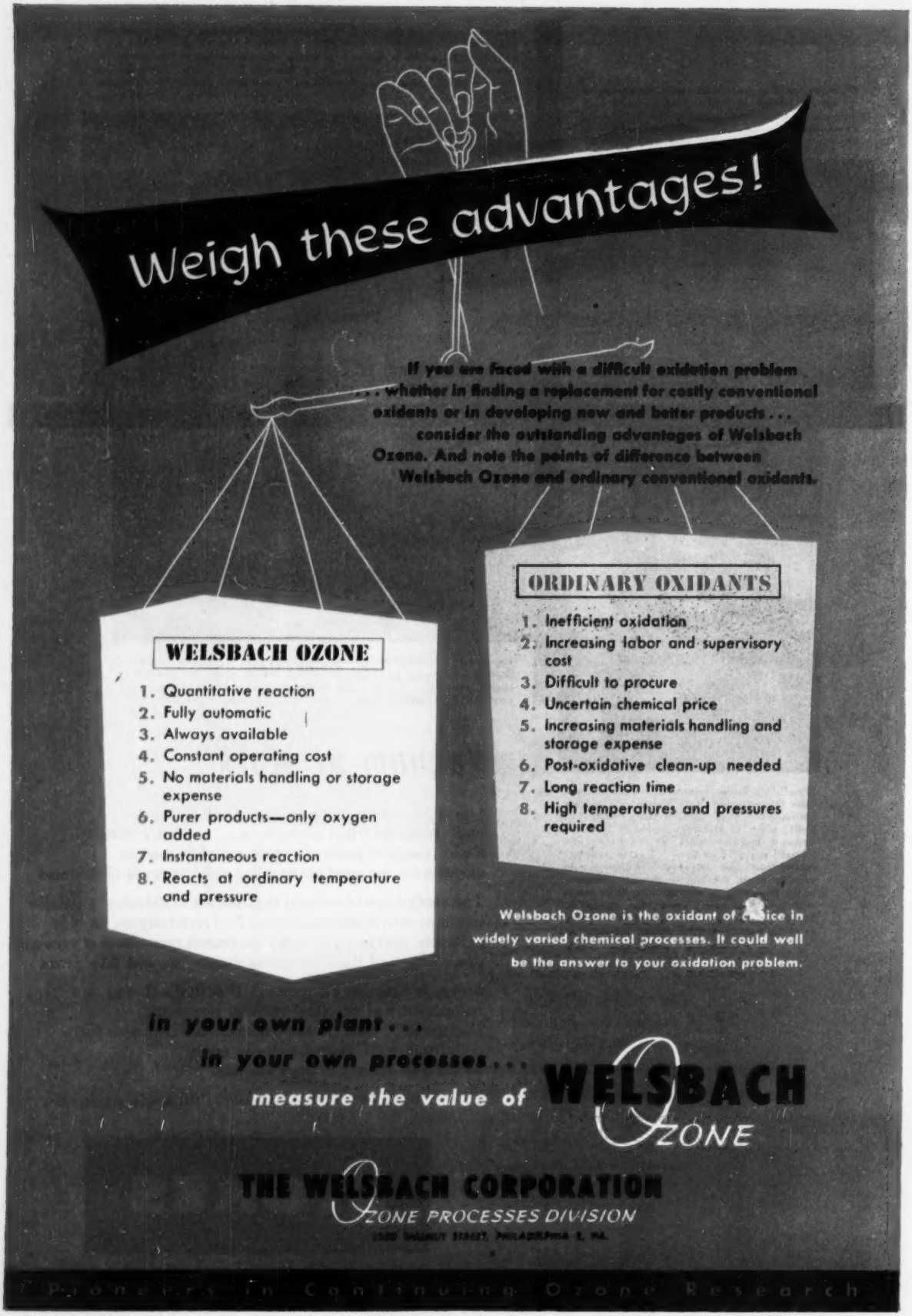
The application of vacuum engineering to industry is a major function with Stokes engineers. And naturally so, for it is at Stokes' that many of today's accepted procedures of vacuum processing had their inception during the last fifty years.

Stokes is FIRST in Vacuum . . . *first* in the design and manufacture of practical vacuum processing equipment . . . and Stokes engineers are available for consultation on opportunities to apply vacuum processing to your business.

F. J. STOKES MACHINE COMPANY, PHILADELPHIA 20, PA.

STOKES

STOKES MAKES: High Vacuum Equipment, Vacuum Pumps and Gages / Industrial Tabletting, Powder Metal and Plastics Molding Presses / Pharmaceutical Equipment

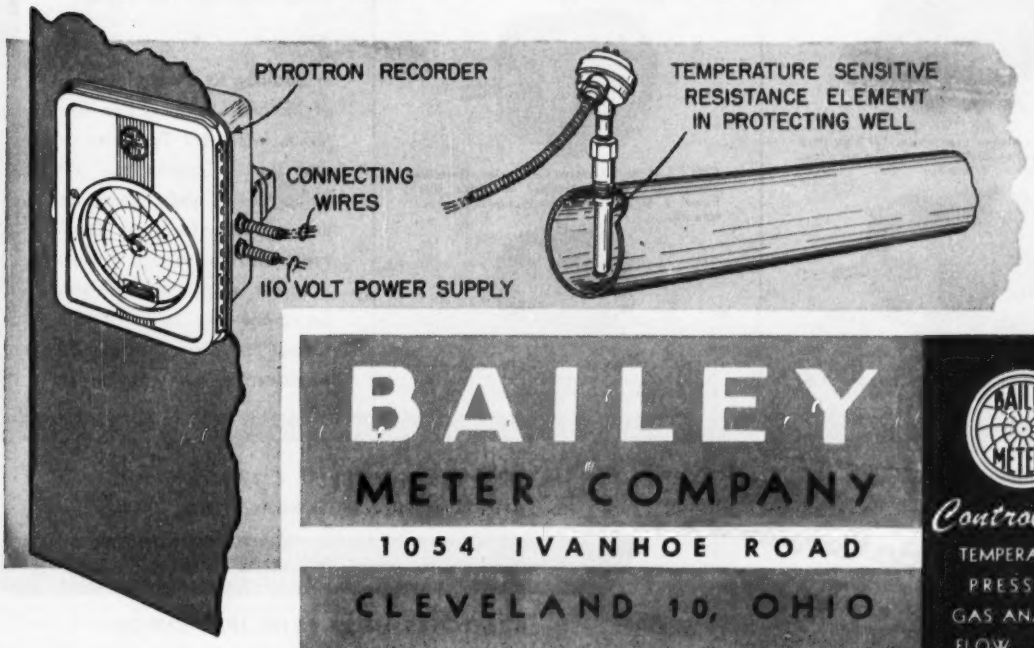

Weigh these advantages!
If you are faced with a difficult oxidation problem . . . whether in finding a replacement for costly conventional oxidants or in developing new and better products . . . consider the outstanding advantages of Welsbach Ozone. And note the points of difference between Welsbach Ozone and ordinary conventional oxidants.
WELSBACH OZONE
1. Quantitative reaction
2. Fully automatic
3. Always available
4. Constant operating cost
5. No materials handling or storage expense
6. Purer products—only oxygen added
7. Instantaneous reaction
8. Reacts at ordinary temperature and pressure
ORDINARY OXIDANTS
1. Inefficient oxidation
2. Increasing labor and supervisory cost
3. Difficult to procure
4. Uncertain chemical price
5. Increasing materials handling and storage expense
6. Post-oxidative clean-up needed
7. Long reaction time
8. High temperatures and pressures required
Welsbach Ozone is the oxidant of choice in widely varied chemical processes. It could well be the answer to your oxidation problem.
in your own plant . . .
in your own processes . . .
measure the value of WELSBACH OZONE
THE WELSBACH CORPORATION
OZONE PROCESSES DIVISION
Pioneers in Continuing Ozone Research

PYROTRON
by BAILEY...

Your best buy for Precision Temperature Measurements In the -300F to 1200F Range

Check These Exclusive Bailey Advantages of Resistance Thermometer Operation

- ✓ Resistance thermometer operation over a complete range from −300F to 1200F has been made possible by Bailey's development of a low-cost platinum resistance element.
- ✓ Resistance thermometer operation requires no standard cell, dry battery and cold junction compensator. Uses 115 volt a-c source. Strong signal and high precision of resistance element as compared to thermocouple makes possible the use of narrow range spans.
- ✓ The Bailey Pyrotron is calibrated at the factory and *remains* accurate; no periodic re-calibrations required. Since all elements are matched it is not necessary to calibrate each recorder to its element.
- ✓ Recorder is sensitive to 1/10 of 1% of range span.
- ✓ Ordinary copper lead wires permit remote location of recorder with respect to the temperature sensing element.
- ✓ For complete information, write for bulletin 230-C on the Bailey Pyrotron Electronic Resistance Thermometer. P-27-1



BAILEY METER COMPANY
1054 IVANHOE ROAD
CLEVELAND 10, OHIO
Complete Controls for Process Plants

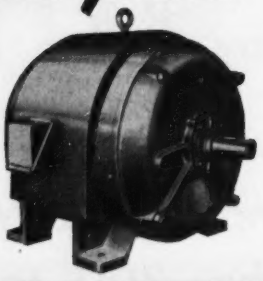
BAILEY METERS
Controls for
TEMPERATURE
PRESSURE
GAS ANALYSIS
FLOW LEVEL
RATIO

Wagner
ELECTRIC MOTORS
...the choice of leaders in industry

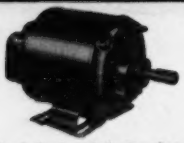
Wagner Quality Motors *for your product or your plant*

Whatever your motor requirements may be—single-phase or polyphase, 1/125 hp or 400 hp—Wagner can offer a standard motor that is entirely dependable in its specific application. The wide variety of motors shown here is typical of the many motors and motor modifications in the complete Wagner line.

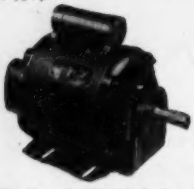
At right is TYPE RP—open type polyphase squirrel-cage motor. It is drip-proof and suitable for all general purpose applications. 1/6 to 400 hp.



SINGLE-PHASE



TYPE RB—*Split-phase Induction. For easy starting applications with high starting current. 1/20 to ⅓ hp.*

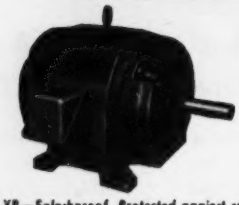


TYPE RK—*Capacitor-Start Induction. For general purpose applications requiring high starting torque—normal starting current. 1/6 to 5 hp.*

TYPE RG—*Repulsion-Induction. For high starting torque applications involving a very long starting period. 1 to 5 hp.*

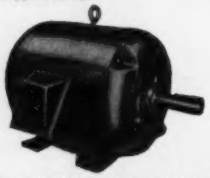
TYPE RA—*Repulsion-Start Induction. For general purpose applications with high starting torque—low starting current. ½ to 15 hp.*

POLYPHASE MOTORS



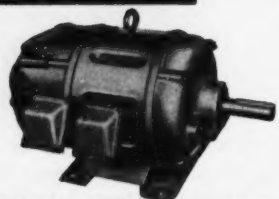
TYPE XP—*Splashproof. Protected against splashing or dripping liquids. ⅜ to 200 hp.*

TYPE TP—*Totally-enclosed, non-ventilated. Fully protected. ¼ to 15 hp.*



TYPE CP—*Totally-Enclosed Fan-Cooled. Protected against dirt, chips, abrasives or fumes. Steel frame. 1 to 250 hp. Also in explosion proof type HP.*

TYPE EP—*Corrosion-resistant Totally-Enclosed Fan-Cooled. Cast iron frame. 2 to 250 hp. Also available in explosion proof type JP.*



TYPE RS-1—*Wound Rotor. Constant or adjustable varying speed. 1 to 250 hp. TYPE RS-2 for intermittent service. 2 to 200 hp.*

GEAR MOTORS—*Single-phase or Polyphase. Open or enclosed types. 1/20 to 50 hp.*

* * *

In addition to a complete line of motors, Wagner also furnishes Increment Type Motor and Starter Combinations, Jet Pump Motors and a complete line of Transformers: Dry-type, Distribution and Power. Wagner engineers welcome an opportunity to serve you. Consult the nearest of our 32 Branch offices, or write direct.

Wagner Electric Corporation EST. 1891

WAGNER ELECTRIC CORPORATION
6407 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

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M53-14

PURE WATER in your plant...

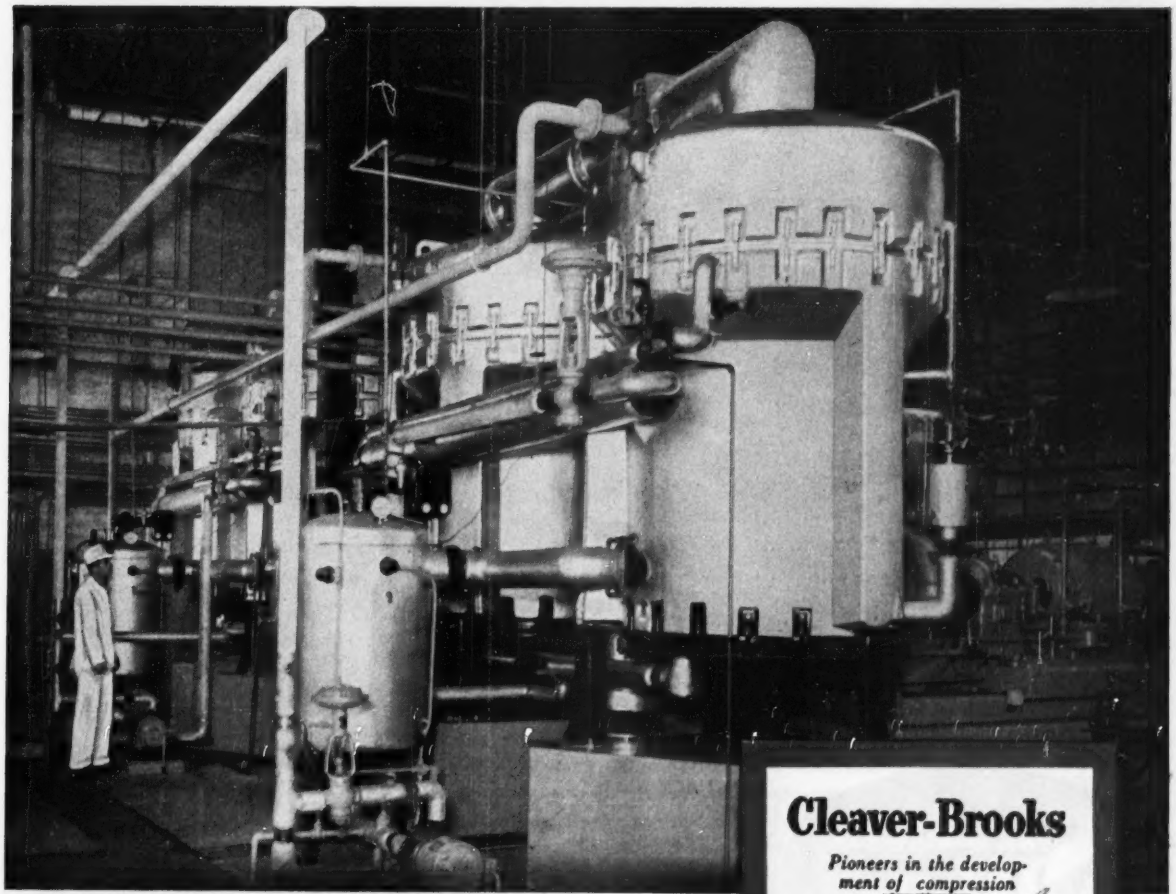
a reliable source of DISTILLED WATER OF LABORATORY QUALITY at lowest cost with CLEAVER-BROOKS compression stills

IF your process requires a supply of chemically pure water, the most reliable and economical way of providing it is to have your own source, independent of pipe lines, trucking or barging facilities.

From any water available, a Cleaver-Brooks Compression Still will give you USP chemically pure, pyrogen-free water . . . of quality far exceeding the high standards needed for chemical processing or pharmaceutical preparations.

Cleaver-Brooks Compression Stills are available in standard sizes to meet your requirements . . . from 85 gph to 2800 gph . . . motor, engine or turbine driven.

Write for latest bulletin "Compression Distillation," Cleaver-Brooks Company, Dept. A-364 E. Keefe Ave., Milwaukee 12, Wisc.



Cleaver-Brooks

Pioneers in the development of compression distillation

Cleaver-Brooks Compression Stills at Arrowhead & Puritas Waters, Inc., Los Angeles, Cal. This plant is one of the largest compression still installations in the world, producing over 100,000 gals. of pure water daily.

Builders of Equipment for the Generation and Utilization of Heat • Steam Boilers • Oil and Bitumen Tank-Car Heaters • Distillation Equipment • Oil- and Gas-Fired Conversion Burners

For Specially Designed

and Fabricated

PROCESSING EQUIPMENT

rely on **STRUTHERS WELLS**

★ **ENGINEERING** ★ **EXPERIENCE**

★ **FACILITIES**

Struthers Wells is your most dependable source for designing and fabricating special processing equipment—for pilot plant or actual production use. Proper use of alloy and stainless steels assures you of the best equipment for exacting service.

The Copper Solution Absorber illustrated below is another answer to a specific need. Why not write us about *your* requirements. You can rely on Struthers Wells for unexcelled equipment and processing results.

COPPER SOLUTION ABSORBER

designed for a specific requirement

DIMENSIONS AND CAPACITY: 38" I.D.
75' LONG
2⅜" THICK PLATE
3½" DIA. STUDS
WORKING PRESSURE: 2,150 LBS.

Struthers Wells

STRUTHERS WELLS CORPORATION TITUSVILLE, PA.

Plants at TITUSVILLE and WARREN, Pa.
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Relamp or Convert to Higher Wattages in **SECONDS...**

with

APPLETON

vented Explosion-Proof Fixtures

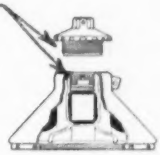
Standardized Unilet Body Permits 58 Second Interchange of 60 Watt to 500 Watt Fixtures . . . Saves Time, Prevents Shutdowns! *Appleton* AA-51 Series Vented Explosion-Proof Fixtures offer the most complete spark-caused disaster protection available today . . . plus the shortest possible lamp exchange time with no loss of man-hours and no lengthy machinery shutdowns.

The AA-51 Series meets all Underwriters' Laboratories requirements for Class I, Groups *C* and *D* Hazardous Locations.

More and more plants in all industries where hazardous locations are present, are standardizing on *Appleton* for maximum, efficient protection.

Full details are available. Write Today for Bulletin!

- **"FLAME-TIGHT" CONTACT CHAMBER**
  Because of *Appleton's* exclusive "5-Thread Safety Chamber" any AA-51 Series Unit can be serviced with complete safety even if current is inadvertently left on!
- **"FULL-CIRCLE" VENTING**
  The notched globe ring and the porous metal interior dissipate heat evenly and safely and keep fixture temperature cool enough to prevent igniting explosive gases.
- **"STAND-BY" SYSTEM SAVES MONEY**
  For every ten AA-51 Units in operation *Appleton* recommends one unit as a stand-by . . . ready for relamping or wattage conversion in 58 seconds.



SOLD THROUGH ELECTRICAL WHOLESALERS

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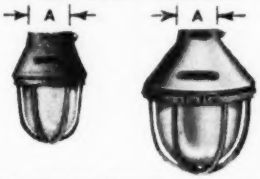
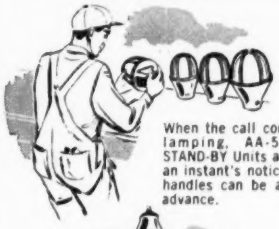
APPLETON ELECTRIC PRODUCTS — REG. U.S. PAT. OFF.

APPLETON INTERCHANGEABLE UNILET BODY FEATURE

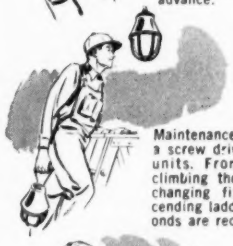


Note how identical diameters "A" at top of Dome Unit Assembly permit mounting of all fixtures regardless of wattage.

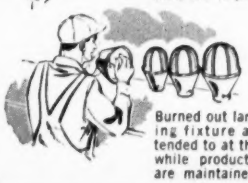
58 SECOND RELAMPING



When the call comes for relamping, AA-51 Series STAND-BY Units are ready at an instant's notice. Carrying handles can be attached in advance.



Maintenance man needs only a screw driver to exchange units. From the time of climbing the ladder to exchanging fixture and descending ladder, only 58 seconds are required.



Burned out lamps and cleaning fixture are safely attended to at the work bench, while production schedules are maintained.

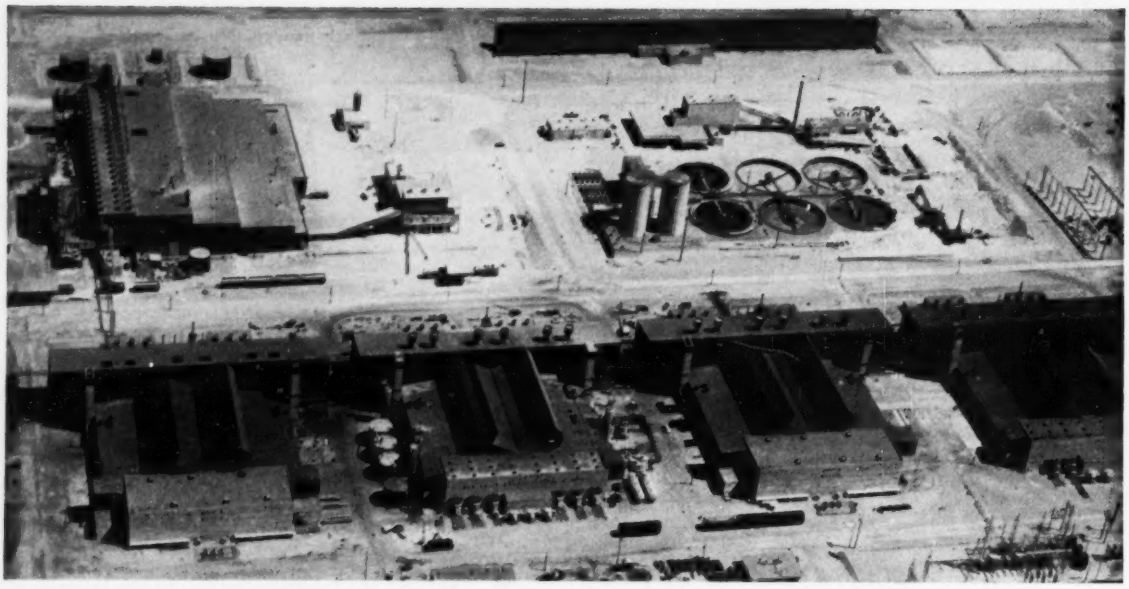
Also Manufacturers of:

Malleable Iron Unilet Fittings

Industrial Lights

"ST" Series Connectors

Outlet Boxes



WECCO PLANT, located at Henderson, Nev., produces 10 tons per day of high grade manganese dioxide.

Manganese Dioxide

A CHEMICAL ENGINEERING PICTURED FLOWSHEET

How the new Western Electrochemical Co. process makes battery grade manganese dioxide from low grade ores.

Western Electrochemical Co.'s new "Schumacher Process" makes high grade MnO_2 from low grade ores. The new method greatly reduces our dependence on the imported, high grade manganese ores—required in older processes. A ten ton per day Wecco plant at Henderson, Nev., turns out MnO_2 for dry cell batteries.

Ore for the Wecco plant comes from nearby mines. The ore is crushed and ground in a hammer mill. It is then mixed with Bunker "C" oil and roasted in a kiln; this converts higher oxides to soluble MnO. The ore is held in the kiln for 20 to 48 min. at a temperature of 750 deg. C.

In a leaching tank, spent electrolyte solution fortified with make-up H_2SO_4 leaches the roasted ore. Leaching is carried out at 60 deg. C. for two hours.

Any insoluble sludge separates out from the leach solution in a thickening tank. The crude leach solution is next treated with barium sulfide in an agitated tank. Cobalt and nickel impurities form insoluble sulfides here. After CaO is added to bring the pH up to between 7.2 and 7.5, the sulfide sludge is removed in another thickener.

Part of the sludge recycles back to the sulfide treatment tank. This is to recover any manganese that may have precipitated with the impurities.

Iron removal (together with sulfur, arsenic, and organics) takes place using an air oxidation technique, in three aeration tanks. Iron sludge resulting from this treatment is filtered on a rotary filter. The filtrate is used as the feed solution for the electrolytic cells.

The cells (there are 33, each with 600 anodes, in the Wecco plant) are maintained at 90-94 deg. C. The current density is kept at 7-9 amp. per sq. ft. and MnO_2 deposits on graphite anodes.

These anodes, which are rod-shaped, are an important feature of the process. MnO_2 does not break away from the rod—a big advantage in that the anode does not have to be removed as frequently as with conventional graphite plates.

This was the key point in the development of the economical Wecco process. It results in long operating cycles and a high ratio of deposit to rod weight.

Deposited MnO_2 and the anodes, after removal from the cells, are separated in a metallurgical jig. The MnO_2 is then ground in a mill until 95 percent passes a 100-mesh screen and 65 percent passes a 200-mesh screen.

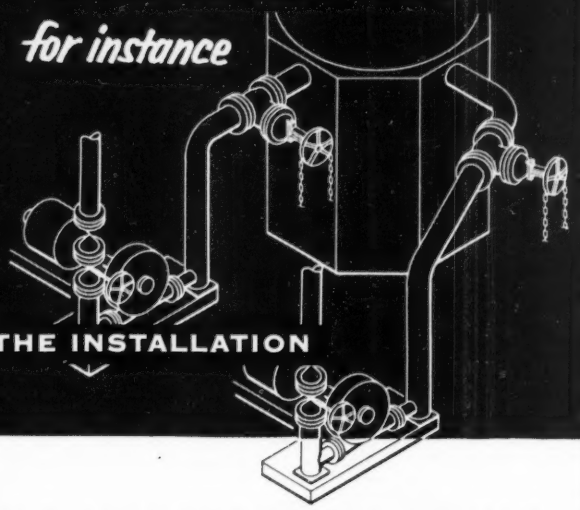
Washing of this fine material takes place in a thickening tank; it is then filtered. Moisture is removed in a rotary dryer. The manganese dioxide is then ready for packing and shipment.

FOR MORE DETAILS

Turn to page 152 for more detailed description of the process and equipment.

You're Sure of Tighter Seating with Crane Steel Gates

...in a Butadiene Plant, for instance



THE INSTALLATION

VALVE SERVICE RATINGS

SUITABILITY:	Have what the job takes
FEATURES:	Epelloy seating
MAINTENANCE COST:	Zero
SERVICE LIFE:	Installed 1951-long life ahead
OPERATING RESULT:	Valve efficiency restored
AVAILABILITY:	Catalog item—No. 33X

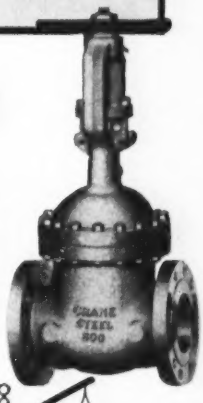
At a Southwestern butadiene plant, using Crane 18-inch steel gate valves on suction lines from extractive distillation towers to pumps. Working pressure, 90 psi, 250 to 300 deg. F.

THE CASE HISTORY

Original valves in this service were lubricated plug valves, but they couldn't be made to seat tightly on the light hydro-carbons and furfural mixture. Their continual leakage burdened the plant with excessive maintenance, and a constant threat to process control. All these lubricated plug valves were replaced with Crane 33X steel wedge gate valves.

Installed more than 2 years ago, the Crane valves completely remedied the leakage trouble, and to date, none have required any maintenance whatsoever. They keep working perfectly with but prescribed routine care.

THE VALVE



Product of pioneer skill in steel casting, and with a long record of service to petroleum and petrochemical industries, Crane steel valves stand apart from the ordinary. Yet they actually cost less for service delivered. Choose from the widest range of body and trim materials; in all pressure classes, sizes; flanged, screwed, or welding ends. See your Crane Catalog.

THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
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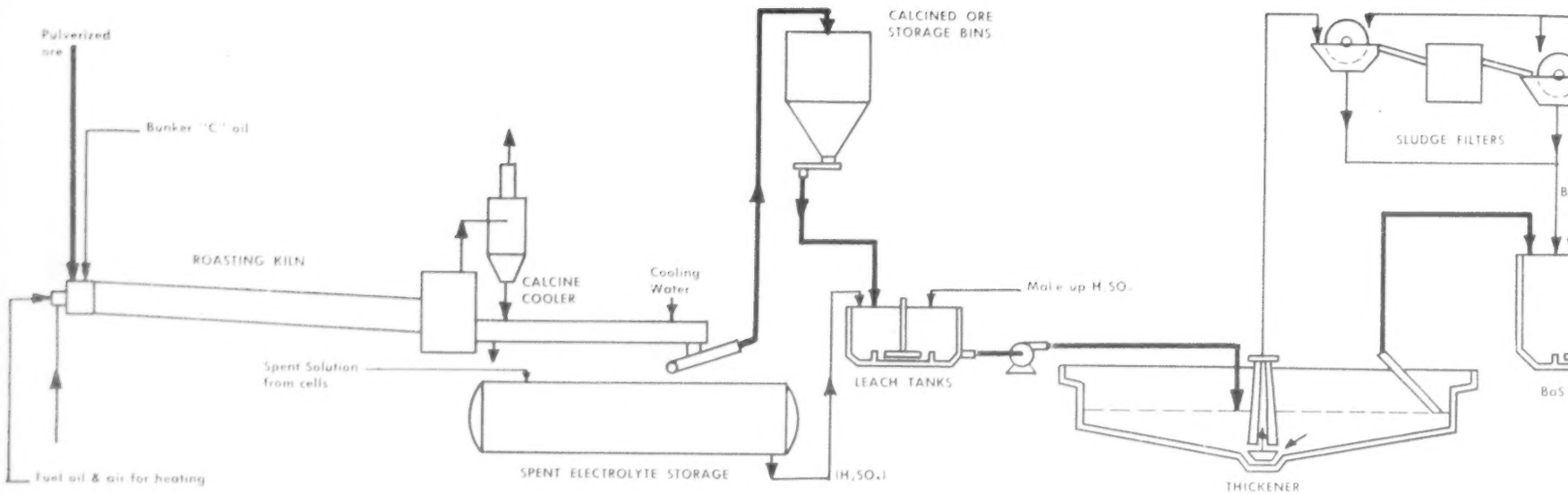
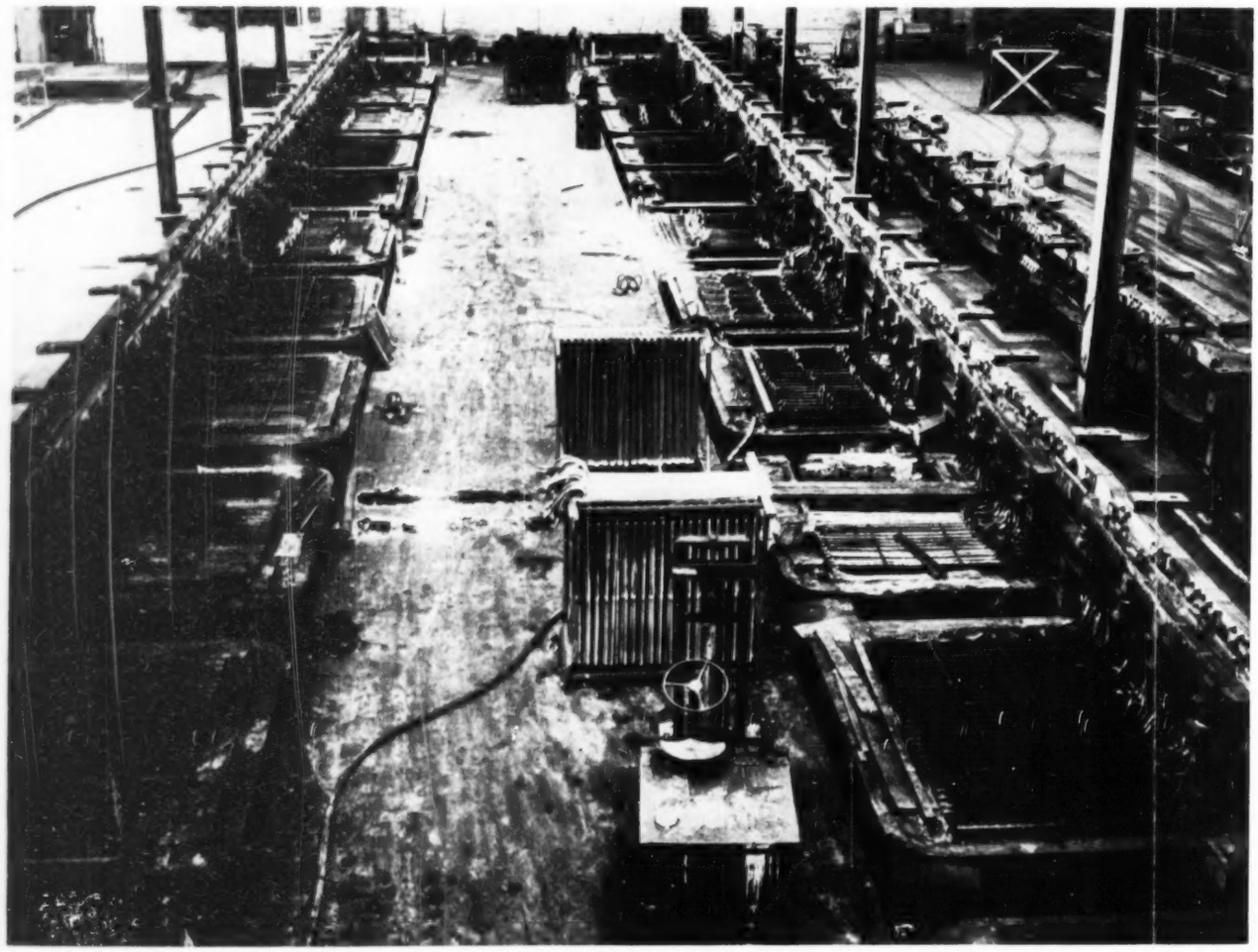
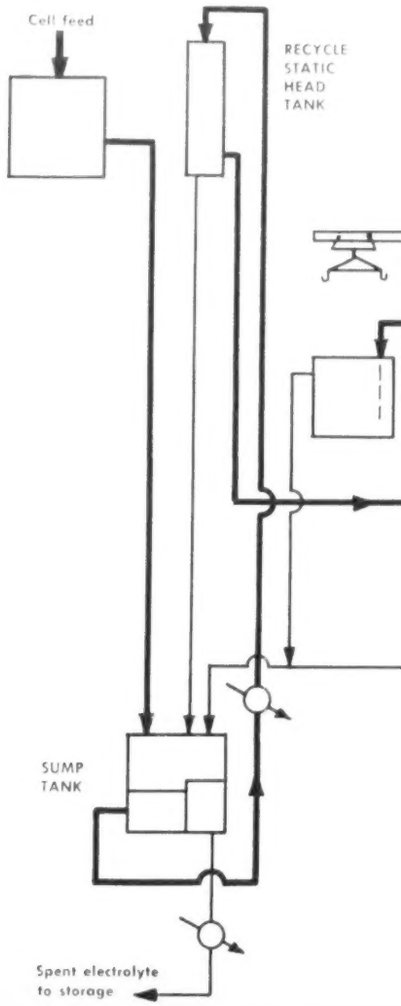
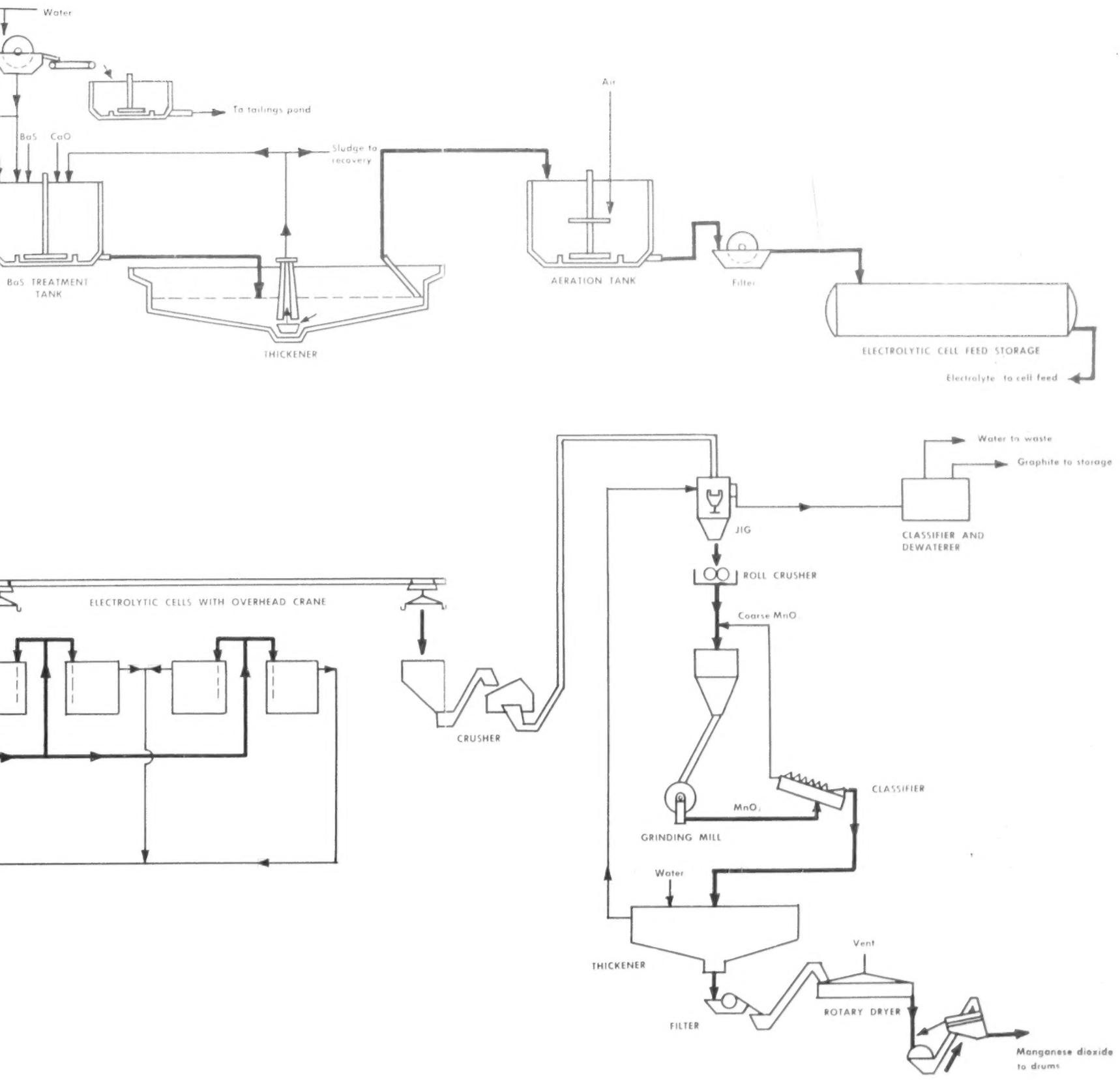
VALVES • FITTINGS • PIPE • PLUMBING • HEATING

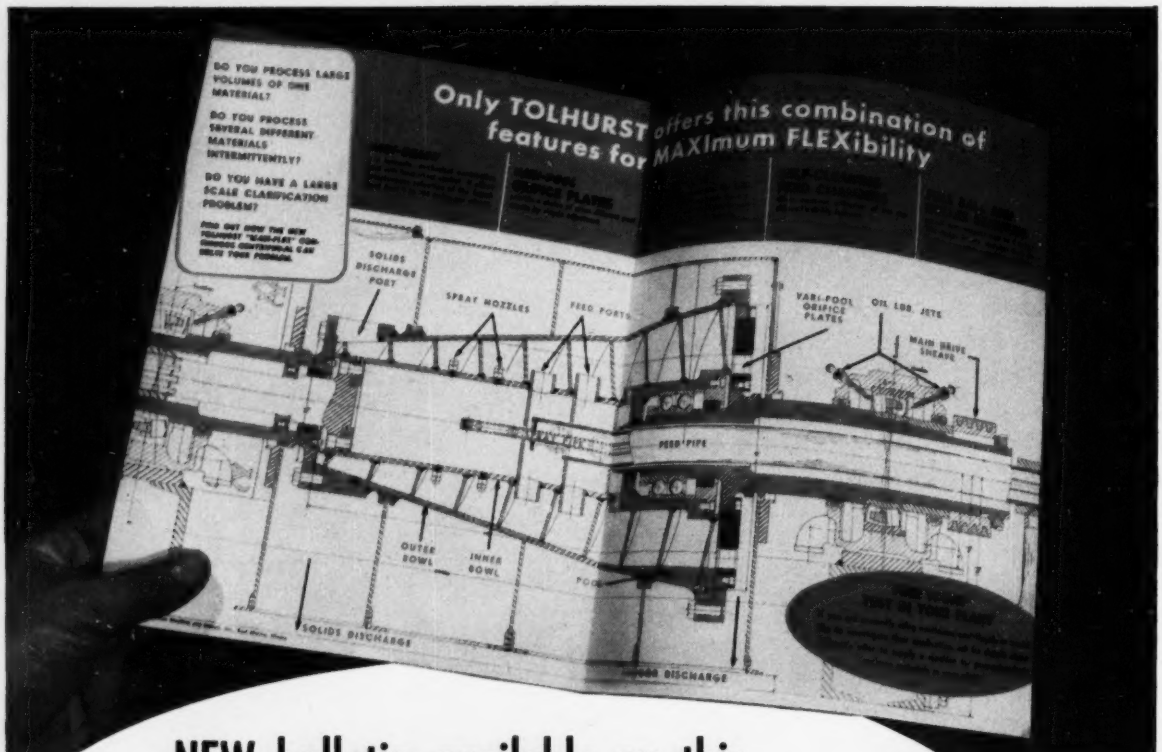




ELECTROLYTIC CELLS are the heart of the process. They have rod-shaped graphite anodes on which MnO_2 deposits.




Water
To tailings pond
BaS
CaO
Sludge to recovery
Air
BaS TREATMENT TANK
THICKENER
AERATION TANK
Filter
ELECTROLYTIC CELL FEED STORAGE
Electrolyte to cell feed
Water to waste
Graphite to storage
JIG
CLASSIFIER AND DEWATERER
ROLL CRUSHER
Coarse MnO2
ELECTROLYTIC CELLS WITH OVERHEAD CRANE
CRUSHER
CLASSIFIER
MnO2
GRINDING MILL
Water
Vent
THICKENER
ROTARY DRYER
FILTER
Manganese dioxide to drums


Only TOLHURST offers this combination of features for MAXImum FLEXibility
DO YOU PROCESS LARGE VOLUMES OF ONE MATERIAL?
DO YOU PROCESS SEVERAL DIFFERENT MATERIALS INTERMITTENTLY?
DO YOU HAVE A LARGE SCALE CLASSIFICATION PROBLEM?
SOLIDS DISCHARGE PORT
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FEED PORTS
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FEED PIPE
OUTER BOWL
INNER BOWL
SOLIDS DISCHARGE

NEW bulletin available on this MOST FLEXIBLE CONTINUOUS CENTRIFUGAL

NEW *"MAXI-FLEX"* IS ADJUSTABLE *3* WAYS

1. **VARI-BEACH** drive allows instantaneous selection of beach speed from 0 to 300 inches per minute.
2. **VARI-POOL ORIFICE PLATES** provide seven different pool depths by simple adjustment.
3. **HIGH F x G** aids difficult separations. Centrifugal force field can be varied up to almost 2,000 times gravity.

Large engineering drawing in this newly released bulletin shows details of "Maxi-Flex" adjustability features, full ball and roller bearing construction and self-cleaning feed chambers. Find out now if this most flexible continuous centrifugal can cut processing costs in your plant. Mail handy coupon below.

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Please send bulletin, "MAXI-FLEX Continuous Centrifugal."

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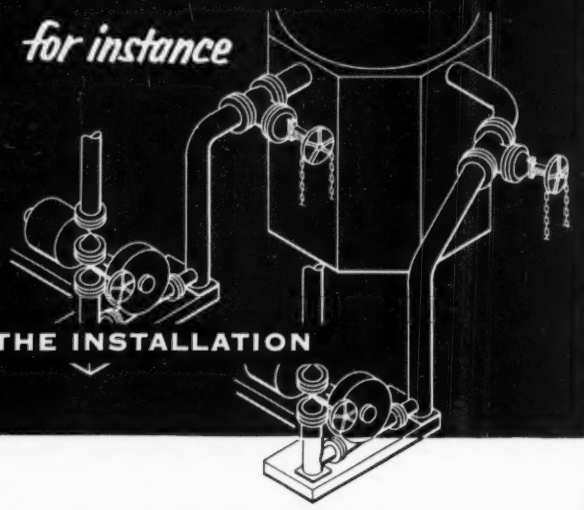
CITY & ZONE STATE

NAME & TITLE

You're Sure of Tighter Seating with Crane Steel Gates

...in a Butadiene Plant, for instance



THE INSTALLATION

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VALVE SERVICE RATINGS

SUITABILITY: Have what the job takes

FEATURES: Epelloy seating

MAINTENANCE COST: Zero

SERVICE LIFE: Installed 1951-long life ahead

OPERATING RESULT: Valve efficiency restored

AVAILABILITY: Catalog item—No. 33X

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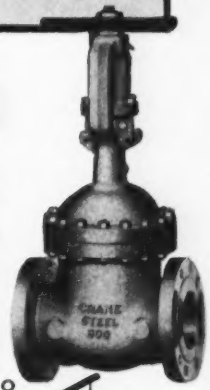
THE VALVE



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THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois

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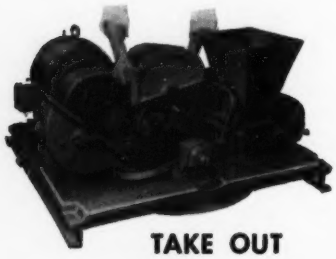
VALVES • FITTINGS • PIPE • PLUMBING • HEATING

A NEW LINE OF RAYMOND PULVERIZING MILLS WITH SCREEN SEPARATION



TAKE OUT SCREEN UNIT

Only a few seconds to open up the mill for quick cleaning or changing screens. This saves valuable time in setting up, or handling different materials with frequent changes between runs.

THESE modern RAY-DUCER Mills are a new addition to the well known Raymond pulverizing, air-separating and flash drying systems.

They are especially designed for grinding or disintegrating a wide range of medium soft materials to specified screen fineness where moderate capacities are required.

Their high-speed hammer action reduces the material rapidly to a uniform powdered product at exceptionally low cost and insures a consistent finished material suitable for special chemical and manufacturing processes.

Raymond RAY-DUCERS offer many advanced features, as well as new ease of control, simplicity of operation, and quick accessibility of interior parts.

WRITE FOR NEW BULLETIN No. 73 Now Ready

If you have a grinding problem, the RAY-DUCER may be an economical solution . . . write for details and tell us your requirements.

COMBUSTION ENGINEERING, INC.

1311 NORTH BRANCH ST., CHICAGO 22, ILL.

Raymond Division

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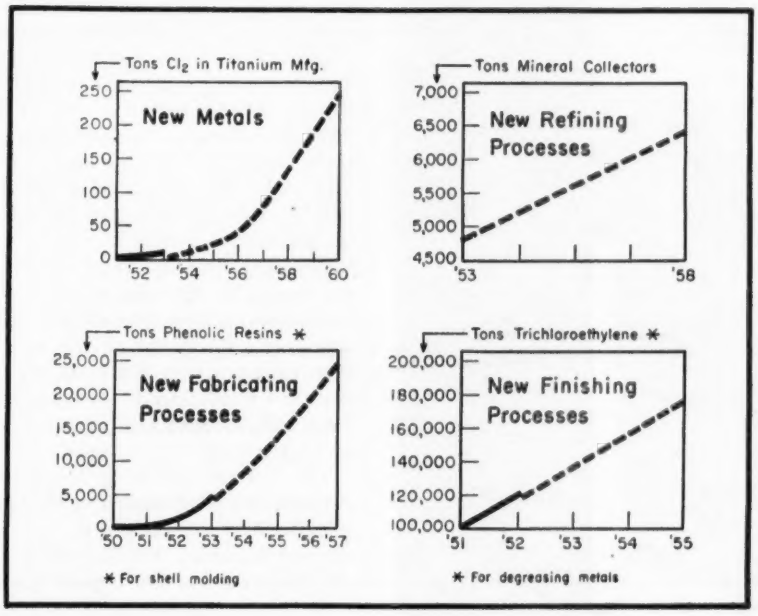

4 Reasons Why . . .

Metals Will Use More Chemicals

Increased application by the metal industry of chemical refining and fabricating processes is going to make a big chemical outlet even bigger in the next decade.

Quenching baths for steel once included such odd chemicals as the urine of red-headed boys or fern-footed goats, herb juices and snails—back in the 17th century. Steel was tempered in horseradish juice or in the dew found on the leaves of chick peas. Iron was heated only after it had been greased with oil of bitter almonds, covered with wax mixed with asafetida and sal alkali and clothed with lute made of horse dung and crushed glass.

This long time interdependence between chemicals and metals has been strengthened over the centuries. Today no two industrial groups have closer ties.

It is the chemical industry which makes possible the extraction of nonferrous metals from low grade ores. Similarly, iron and steel producers use vast supplies of chemical products. And metal producers themselves are becoming important producers of chemicals, a move forced on them by the need to get rid of the sulfur present in most ores.

Chemical manufacturers, in turn, rely heavily on the metallurgical industry for storage facilities, pipelines, process units, shipping containers as well as for many types of corrosion resistant metals and alloys.

This growing alliance between chemicals and metals was explored at a recent meeting of the Chemical Market Research Association at Pocono Manor, Pa. Experts from various fields traced the history and explored the future use patterns of chemicals in metal refining and fabricating.

▶ **Mineral Beneficiation**—This technique which involves, broadly speaking, treating crude crusts of the earth in order to obtain usable products is becoming increasingly important. Although some ores are still rich enough to permit economic smelting without elaborate chemical dressing, they are becoming very scarce.

It's estimated, for example, that more than 95 percent of the world's copper comes from ores with only about 1 percent of this element while smelters operate most efficiently at a copper concentration of 20-30 percent and must have a minimum concentration of 6 percent.

Chemicals come to the rescue, however, concentrating these low grade ores through flotation processes. After ores are mined, crushed and ground, they are fed to flotation machines where they are treated with a wide variety of chemicals, including collectors (mostly ethyl through hexyl xanthates), frothers (pine oil, cresylic acid, lower alcohols and Dow's polypropylene methyl glycol ether) and modifying reagents.

The world market for collectors is about 30 million lb., 32.8 percent of which is sold in the U. S. Predictions are that this figure will approach 40 million lb. in the next five years. The U. S. also buys about 58 percent of the estimated world consumption of frothers (24.8 million lb.). The next five years should see a 9 million lb. increase in this field.

Annual consumption in North America of modifying agents currently includes 508 million lb. of lime, 74 million lb. of soda ash, 29 million lb. of zinc sulfate and 9¼ million lb. of sodium cyanide. The total world market for sodium cyanide for flotation is 13 million lb., excluding cyanide used for gold and silver refining.

▶ **Pickling**—The greatest single use of chemicals in metalworking involves acid pickling, mostly with sulfuric. In 1952, 5 percent of all sulfuric acid produced—about ¾ million short tons—was consumed in iron and steel pickling. About 25 percent of the U. S. production of muriatic acid goes into metal treating and hydrofluoric acid is used largely in the pickling of stainless steels.

▶ **Cleaning**—Large quantities of caustic, soda ash, phosphates and silicates are used to remove oil and foreign material from metal surfaces. These and other chemicals are compounded

Poised in a corner
of your plant,
like a deadly serpent,
fire is ready to strike!

In flammable liquids,
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fully Automatic CO_2
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into different cleaning products, each with a special purpose. Often the cleaning action is carried out in soak tanks, but recently equipment for spray cleaning of metals has served.

Solvent and vapor degreasing are important aspects of modern metallurgy. A volatile solvent is used as a soak, spray or vapor to remove grease, trichloroethylene being the most common. More than 90 percent of all the trichlor sold—270 million lb. in 1952—is used in this service.

▶ **Phosphate Coating**—These coatings are applied to steel surfaces to form an interlocked, dense film which holds and absorbs special organic lubricants in its porous surface. The coatings are also used preparatory to painting because paint adheres with more stability to phosphate coated metals.

The Fos process—being tested by Pennsalt—is a good example of the key role played by chemicals in the metalworking industries. Alkaline cleaning, phosphate coating and organic lubricants enable manufacturers to cold form many shapes in presses. This eliminates more than 75 percent of the machining and provides better parts in less time at lower cost. When tubes, shafts, piston pins and other shapes are formed in this manner the number of dies needed is sharply cut. But the number and quantity of chemicals used is stepped up greatly.

Manufacturers of automobiles, appliances, containers, metal furniture and farm machinery are making increased use of metal phosphatizing. Nearly $6 million of phosphates are used for paint bonding each year. Zinc phosphates hold 75 percent of the current market, but the trend seems to be toward iron.

▶ **Other Operations**—There are many other metallurgical processes which can now be carried out more effectively with chemical products. Lubricants and resins in stamping, fluxes in welding and soldering, cutting oils and coolants in machining, binders and grain refiners in casting, quench oils and ammonia in heat treating, descaling salts in forging and phosphates and lime in drawing and extruding are but a few examples.

▶ **Outlay for Chemicals**—According to the Division of Interindustry Economics of the Bureau of Labor Statistics, every million dollars of output by the fabricated metal products industry

in 1947 involved a $14,000 expenditure on chemical products.

These BLS studies—usually referred to as input-output analysis—offer the most detailed information available on interindustry sales and purchases. So complex is the statistical task of preparing these reports (see Chem. Eng., Nov. 1953, p. 130) that 1947 is the most recent year available.

But if this ratio hasn't changed significantly since 1947—and it seems safe to assume that any change would indicate greater chemical purchases per million dollars of output, not only in metalworking, but in mining and refining—purchases of chemicals by the metal fabricators amounted to $1.4 billion in 1952. Clearly, metals and chemicals go well together.

Capital Expenditures Will Drop 8 Percent Next Year

Manufacturing industries now plan to invest 8 percent less in new plants and equipment in 1954 than they did in 1953. This is the result of a survey of companies made by the McGraw-Hill Dept. of Economics in October. Declines are surprisingly small, considering that spending in 1953 has been at record levels.

Here are the detailed figures on capital spending plans:

Expenditures for New Plants and Equipment (Million of Dollars)

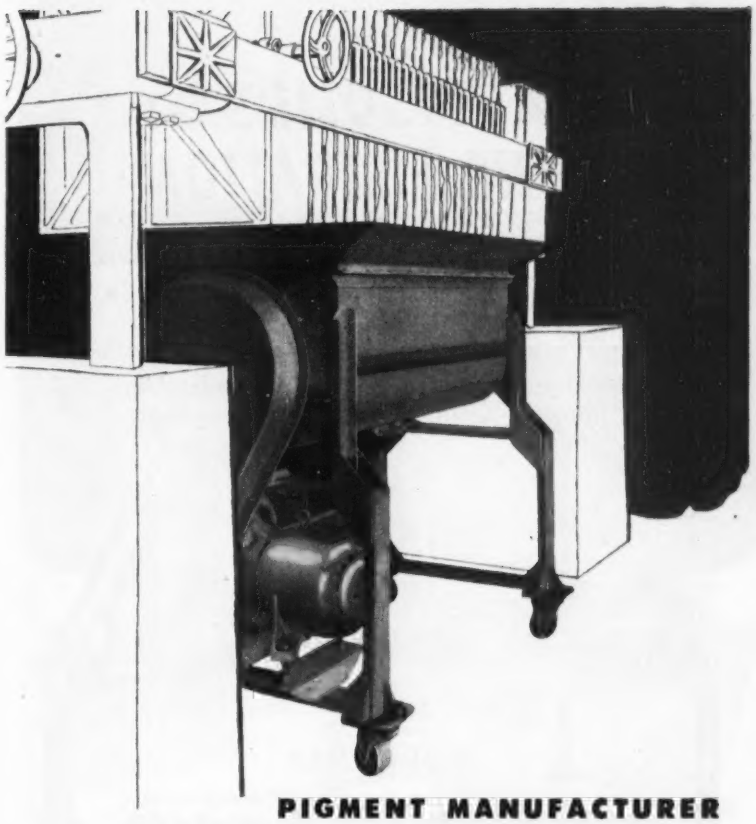
Industry	Est. 1953	Plans 1954	Change
Chemicals	$1,800	$1,546	−14%
Petroleum	2,824	2,757	−2
Textiles	296	260	−12
Food	841	841	0
Steel	1,460	1,108	−24
Automobiles	923	1,063	+15
Machinery	899	805	−10
Electrical Machinery	463	512	+10
Transportation Equipment	215	196	−9
Other Manufacturing*	2,969	2,595	−13
Total Manufacturing	12,690	11,683	−8

* Includes nonferrous metals (refining and fabricating), building materials, containers, paper, rubber, furniture and apparel.

The drop in chemical industry spending is concentrated in two fields: heavy chemicals and rayon chemicals. Capacity in these lines has expanded faster than markets. Integrated companies that make a wide variety of products are not cutting investment so sharply.

The petroleum industry plans expenditures close to the 1953 level. All divisions—production, refining and marketing—evidently expect to maintain a high level of spending.

The decline in manufacturers' investment is mostly related to the completion of defense expansion pro-



PIGMENT MANUFACTURER BREAKS PRODUCTION BOTTLENECK WITH READCO MIXERS

A large producer of water soluble paint pigments faced a problem confronting many management men... how to get more production—in a hurry.

In an analysis of his process, a bottleneck was found. Pigment solids were being removed from the emulsion in filter presses. Unmanageable filter cake was being scraped from the presses and shoveled into drums, a costly, time-consuming process.

A series of laboratory tests pointed out the simple solution. A battery of Readco Spiral Ribbon Mixers was installed beneath the presses. These mixers reduce the cake into a homogeneous, semi-liquid mass, ready for shipment. Processing time and costs have been greatly reduced.

You can approach your production problems in the same way. The Read Standard Corporation not only manufactures a broad line of chemical processing equipment, it offers you the services of its engineering specialists and laboratory facilities to assist you in the solution of your special processing problem.

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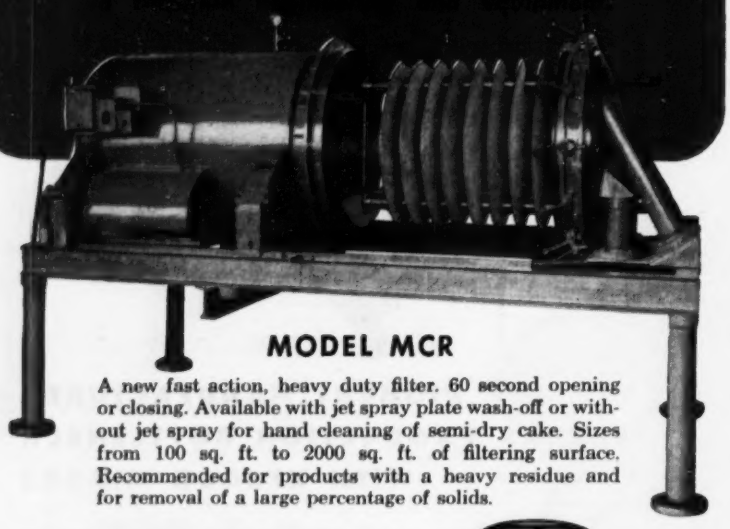

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A new fast action, heavy duty filter. 60 second opening or closing. Available with jet spray plate wash-off or without jet spray for hand cleaning of semi-dry cake. Sizes from 100 sq. ft. to 2000 sq. ft. of filtering surface. Recommended for products with a heavy residue and for removal of a large percentage of solids.

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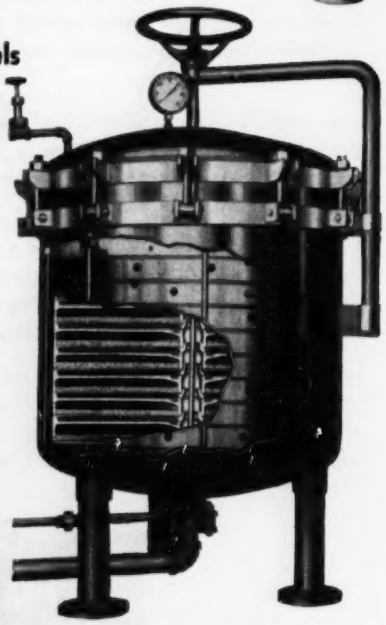
For many years the accepted standard for fine filtering. Positive cake stability, no slipping or cracking, under any pressure variation or with complete shut-down of filtering, is an exclusive feature of the Sparkler horizontal plate filter that has earned a wide acceptance and use of this filter. Filter aids can be floated on the plate evenly at low pressure and fine sharp filtration obtained right from the start with a thin low density pre-coat. No other filter can match this performance. Available in plate capacities up to 150 sq. ft. of filtering surface. Tanks and plates available in a wide range of metals including Hastelloy, stainless steel, etc.

Write Mr. Eric Anderson for personal service on your filtering requirements.



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Service representatives in principal cities: • Sparkler Western Hemisphere Corp., Mundelein, Ill., U.S.A. • Sparkler International Ltd., Prinsengracht 876, Amsterdam, Holland • Komitter & Co., 35 Chittaranjan Ave., Calcutta 12, India.

grams. There is no evidence of widespread cutbacks in anticipation of a business recession.

And the drop is mainly in new construction and expansion of capacity, chiefly in industries—like steel and aluminum—which have met their defense goals. There are still big plans for installing new machinery, particularly in consumer goods industries.

Big companies with long-range modernization and expansion programs are providing the main support for capital spending. Although only 40 percent of the companies participating in the survey plan to maintain or raise spending next year, some of the very largest are boosting expenditures substantially. Smaller companies are continuing to cut back on investment in plants and equipment, as they did in 1953.

Christmas Trees Provide Growing Chemical Market

Over half the 30 million Christmas trees sold this year will have chemical treatment, ranging from home sprayed applications of "snow" to complete dipping in large plants. And in the not too distant future it's expected that practically all trees sold will have flame-retardant coatings.

The incentive is strong. A 6 to 8-ft. tree in its natural state brings about $3, a coated one of the same size, as much as $25. What the buyer gets for his money is flame resistance, color, gloss, reduced dehydration and less needle loss.

All this means a nice outlet for chemicals. A 6-ft. tree coated by a retailer on his lot requires up to 6-8 lb. of rayon flox at $1 a pound, 3-4 lb.

of polyvinyl latex at 56¢ a pound, plus significant quantities of pigments, phosphates and chlorinated waxes.

About 2½ million coated trees will come from two processing plants at Duluth, Minn., operated by Kirk-Minnesota Co. and Halverson Trees, Inc. The two plants use an estimated 250,000 gal. of coating annually, with a retail value of over $1 million. This relatively low amount of chemicals (compared with the quantities used on retail lots) results from the use of precise dipping with little waste. Also, operations are limited to the smaller stunted black spruce.

Northern Minnesota's stunted black spruce, growing to a uniform height of 3 ft., is good for nothing except Christmas trees, and good for that only after chemical treatment. Without treatment, its needles fall off soon after cutting. But when coated with a special low monomer pentaerythritol ester in a non-toxic, ammonia-carried polyvinyl latex the tree can be kept in cold storage for as long as nine months.

After the latex film has set, each tree receives a hollow metal base containing a viscous liquid made up of glycerine, monosacharides and formaldehyde to feed the tree for months.

This system has three major disadvantages, however. Plant location is restricted to tree-growing areas. Trees going through must be of uniform height and, except for stunted black spruce, such uniformity is hard to find. Investment cost is high (a minimum of $200,000 for a plant able to process 23,000 trees a day).

But while the producer coats trees mainly to get them to market in good shape, the retail dealer does so to increase their sales appeal. An estimated 10 million trees are treated annually on the sales lots, at a cost to the buyer of 50¢ to $1 a foot. In California, for example, about half of all the trees sold must be flame resistant before they leave the lots in order to comply with state law. The law applies only to trees exhibited in public places, but the home user is getting more fire safety conscious every year.

This type of coating generally consits of thick latex, such as polyvinyl chloride acetate, followed by granular ammonium phosphate. Often chlorinated waxes are added to provide better protection. Coatings of rayon flox up to an inch thick make a good "snow."

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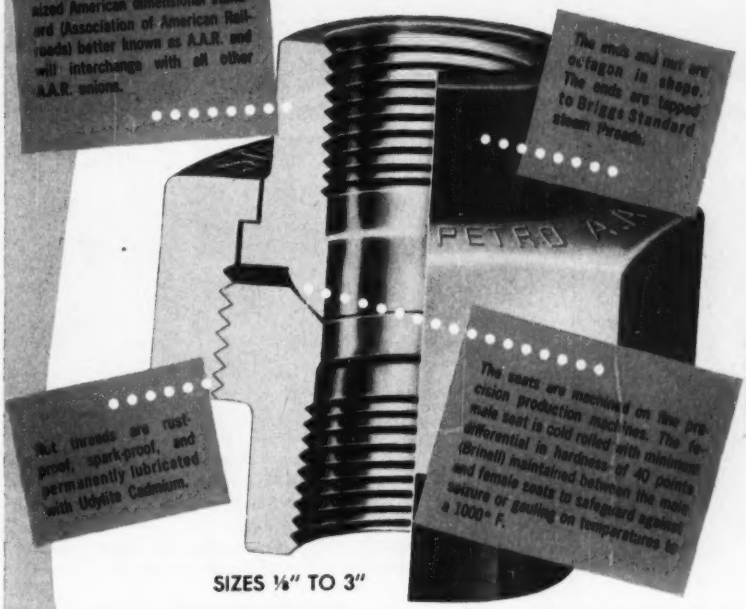
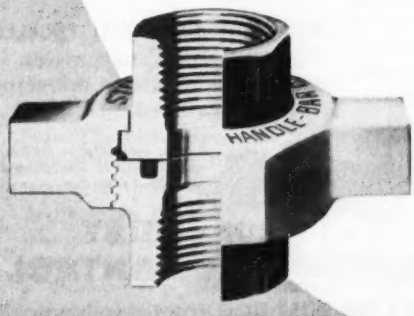

Petro Unions conform to a recognized American dimensional standard (Association of American Railroads) better known as A.A.R. and will interchange with all other A.A.R. unions.
The ends and nut are octagon in shape. The ends are tapped to Briggs Standard steam threads.
PETRO A.A.R.
Nut threads are rust-proof, spark-proof, and permanently lubricated with Udylite Cadmium.
The seats are machined on two precision production machines. The female seat is cold rolled with minimum differential in hardness of 40 points (Brinell) maintained between the male and female seats to safeguard against seizure or galling on temperatures to a 1000° F.

SIZES ⅛" TO 3"

PETRO A.A.R.

This union is hot-forged of A.I.S.I. 1023 open hearth, silicon killed forging steel. It meets all chemical specifications for forged steel pipe fittings. It is rated for temperatures from 100° below zero F. to 1000° above zero F. and on pressures 900 S.W.P. and 3000 lbs. C.W.P.



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These unions do not depend on compression or force, as the terms relate to common gasket type unions. A positive pressure is affected with a synthetic oil-resistant "O" Ring set in a groove between two mating surfaces. "O" Ring, although replaceable, will not drop out when union is disconnected.

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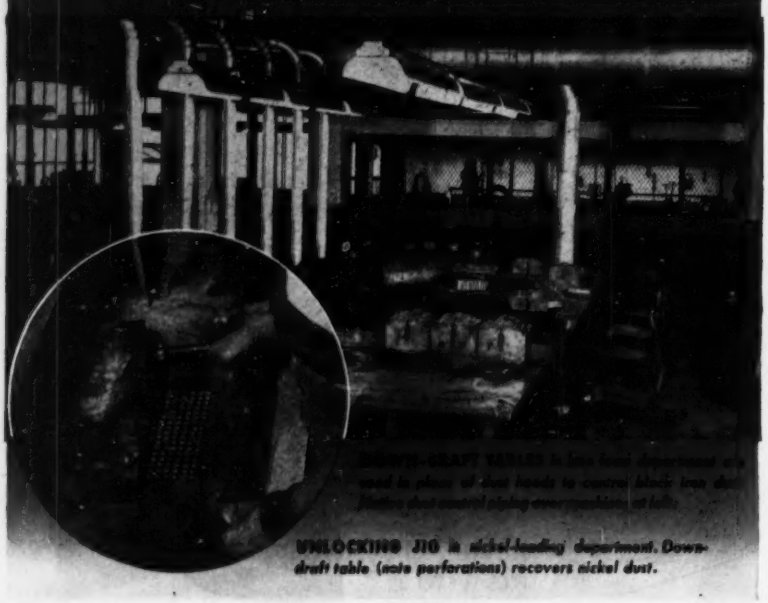
Pangborn Dust Control *pays for itself* in recovered material

at Thomas A. Edison, Incorporated



UNLOCKING JIG in nickel-loading department. Down-draft table (note perforations) recovers nickel dust.

MANUFACTURING nickel-iron-alkaline storage batteries at Thomas A. Edison, Incorporated, creates nickel, nickel-hydrate, and iron-oxide dusts. Control and recovery of these valuable dusts was complicated by their light weight, which in some processes prevented the use of regular dust-collecting hoods. Pangborn engineers solved this problem by utilizing down-draft tables in a unique dust control system geared to Edison's particular requirements.

RESULTS? The Pangborn system pays for itself in recovered dust alone. In addition, the dust-free atmosphere has improved working conditions in the plant. Although this Pangborn dust control system is a major installation, it was completed without loss of a single day's production!

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ECONOMICS, *cont . . .*

Biggest argument against spraying on the lot is the tremendous waste. Spraying trees is like spraying window screens—there's an 80 percent loss in overspray. Yet in cases where preservative treatment is desirable, producers have been reluctant to apply it in their plants because of the variety in tree sizes and the huge drying problem. Instead, they encourage the retailer to coat the trees as soon as he gets them and are willing to provide materials and know-how.

If the buyer doesn't like the coated trees on the lot, he can still treat his own, thanks to widely-available kits of fire retardant or decorative materials. A typical product provides 12 oz. of "magic flakes" for 98¢. All the tree-buyer has to do is press the button on top and let gas pressure do the rest.

Revise Tariffs, Don't Cut Them!

General reduction of U. S. import duties would, in effect, be importing depression, according to Calvin A. Campbell, vice president of the Dow Chemical Co. While advocating certain tariff revisions and customs simplifications, Campbell holds that a completely free trade has only doubtful benefits, but very real dangers.

The so-called "dollar gap" has already been closed as far as domestic commerce is concerned. U. S. aid is now largely military and Campbell feels that this country cannot simply buy large quantities of yard goods or tuna fish and hope that the recipient country will put the dollars received into guns. The only way to assure military preparedness in a foreign country is to put it there.

Campbell also questions the need for making U. S. markets more available to other free nations, pointing out that western Europe already has raised its production to a level 140 percent above prewar. In addition, these countries are rapidly recovering South American and other markets which were lost during the war.

"When we are faced with competition from people who are willing to work for one-fourth as much as we are," said Campbell, "we shall inevitably downgrade the standard of living of our own people." He also believes that industries injured by tariff reductions would have only two alternatives: go out of business or

emigrate to a foreign country to take advantage of cheap labor. Either move would greatly weaken the U. S., both now and in the event of war.

In place of tariff reductions, the chemical executive suggested strengthening our tariff law by eliminating so-called favored nation clauses and substituting bi-lateral trade agreements. He also recommended simplifying customs procedures, reducing or eliminating duties on materials for which the U. S. has no domestic source and a broader program of insurance to protect and encourage American investment abroad.

Outside Financing: Key To Chemical Growth

Profits tell only part of the chemical success story. Growth today also means financing, bringing new money into a business above and beyond what the company is able to earn and save. This was not necessarily a problem some years ago when tax rates and realistic depreciation allowances made it possible to expand through retained savings. But the "boot strap" era is just about ended.

Last April the largest corporate debt issue ever offered to the American public—$200 million—was sold for Allied Chemical & Dye Corp., one of the last major companies to bow to the logic of long term debt to accomplish its expansion purposes. Before that Union Carbide decided to borrow an even larger amount, $300 million, from a group of institutional investors. You can quickly count the major publicly owned chemical companies still without debt — Du Pont, Hercules, Kodak, Pennsalt, American Agricultural Chemical and Victor.

But why do businesses feel inclined to borrow rather than sell common stock, particularly when chemical equities have held such a favored market position in recent years? Although U. S. corporations raised more money through common stock sales last year than in any other year, equity financing was dwarfed by debt offerings that totaled five times as much.

The reasons aren't hard to discover. Under present laws a company in the top excess-profit bracket can pay as much as 6.67 percent for its borrowed funds without cost to the corporation after Uncle Sam has taken his cut. This is because a "credit," or an exemption from paying excess profit

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This new industrial pH Meter takes advantage of modern electronic engineering, using miniature and subminiature tubes and printed circuits. It is only one-quarter the size of conventional pH instruments ... and is designed to save maintenance costs by sturdy, moisture-proof construction. The instrument circuit is of a completely new Unitized design — made in three separate plug-in sections, any of which can be interchanged in the field to avoid downtime.

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SPLASH PROOF
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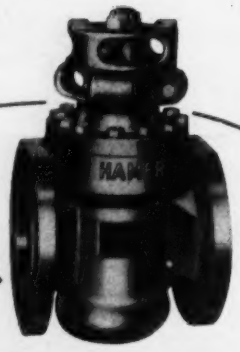
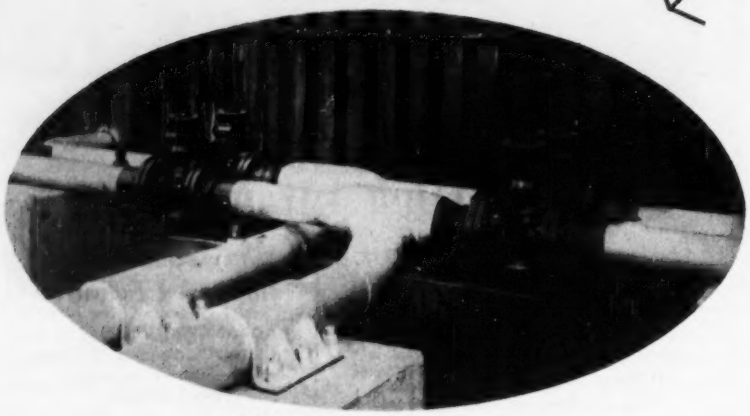


Model FS15P illustrated here has Pressure Seal packings which require neither tightening nor adjustment.



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taxes, of nearly 10 percent of the borrowed amount may be applied against taxable earnings.

Conversely, borrowing money at the conventional bank rate—4 percent—has profitable implications under excess profit taxes beyond the productive potentialities of the facilities for which the money was borrowed and spent.

The deductible treatment of bond interest in comparison with the double taxation of stock dividends is looked upon as another pro-debt argument. Besides this, capital gains taxation, by lessening the liquidity of the market, also tends to discourage equity financing over the long run. The government actively encourages corporation debt, too, through the medium of Certificates of Necessity providing rapid amortization of the cost of new facilities. Actually, these in themselves made possible a large portion of the industrial expansion in the last few years.

Finally, and as important as any single factor, is the so-called "leverage factor." Assuming that a company establishes a yardstick based on past experience whereby it expects to earn a minimum rate of return on its invested capital, borrowed money accomplishes the same purpose as the "more expensive" equity money and, like a lever, widens the rate of return on the funds which the corporation itself puts to work in an expansion financing.

Monsanto is an actual example. In 1952 it borrowed $66 million in the form of 50-year debentures from a group of six institutional investors. At the same time, it sold 400,000 shares of additional common stock. Monsanto in 1952 earned 11.6 percent on its capital and surplus and new equity would be expected to produce at least these results. But instead of 11.6 percent, the debentures are paying 3¾ percent.

The trend toward outside financing is growing. In the chemical industry at the end of 1951, a survey of 20 companies showed their capital structures contained 10.4 percent long term debt, 12.5 percent preferred stock and 77.1 percent common stock, still far from unbalanced in favor of senior capital. But in 1952 some 40 companies raised about $1 billion, of which $150 million came from common stock, $420 million from public

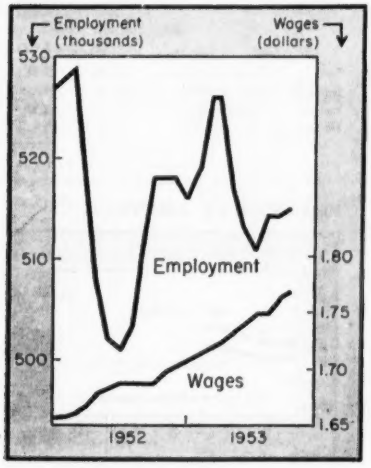
bond sales and $450 million from institutional investors for debt-type securities.

This analysis is based on a talk by W. H. McElnea, Jr., Asst. Secretary, Empire Trust Co., before the New York Section, A.I.Ch.E., Oct. 22, 1953.

Freed Nickel Doesn't Mean Unlimited Supply

Although since November 1 nickel consumers have been able to use all they can get without government controls, supplies are still falling way short of military and civilian demand. And that condition is likely to hold true for a long time to come.

The government's decontrol action wasn't based on an "adequate supply" situation, but rather on the premise that although there is dislocation and hardship in the nickel industry, private industry can better cope with it than can the federal government. Right or wrong, at least there will be fewer forms to fill out.



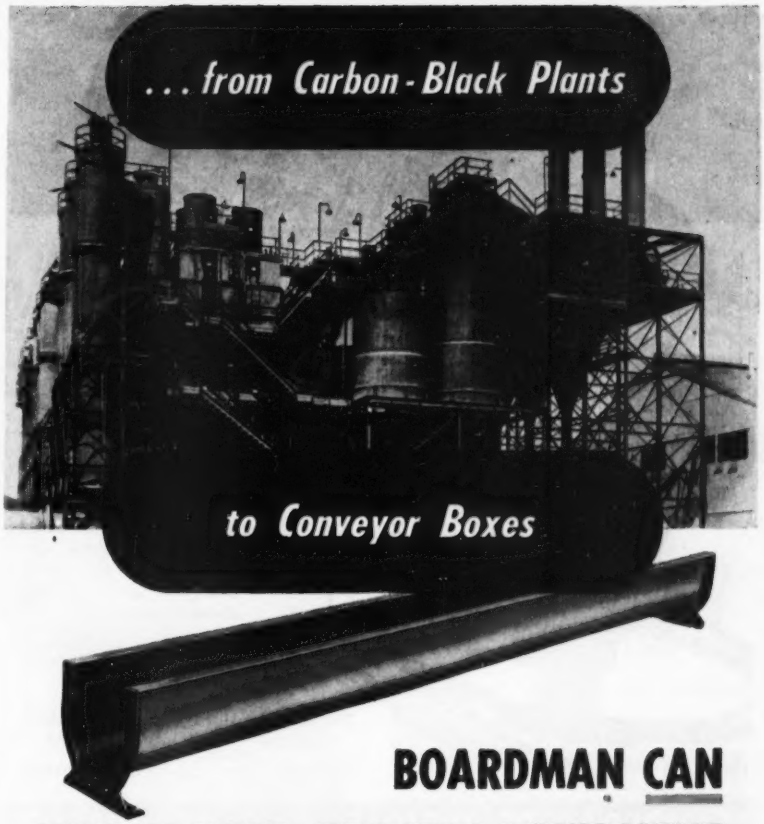
What's Happening . . .

. . . IN EMPLOYMENT

Current employment figures are substantially under peak levels of late 1951. Nearly 20,000 fewer workers are on payrolls of chemical plants. But the average number of production workers employed in 1953 will be about the same as in 1952.

. . . IN WAGES

Wages, on the other hand, head up, up and up. The latest available figure is just under $1.90 per hour. Almost every month a new record is set in the chemical industry. If the present trend continues, average hourly pay will reach $2 before long.



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Even within a single product category, BOARDMAN designs, engineers and fabricates to specific needs. In conveyor systems, for example, BOARDMAN offers stainless steel or rubber-faced steel plate . . . screw, belt or paddle conveyors . . . standard or steam-jacketed . . . porcelain and other special liners . . . formed or angle iron tops . . . steel flanges or butt strap joints . . . slip-on, bolted, spring clip or weatherproof covers . . . and any other custom specification you may require.

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Sanitary fittings throughout.
Illustration shows large production Mill Model QV-11 with 15 H.P. motor

Eppenbach **Colloid Mills operate at speeds approaching the theoretical minimum required for true wet micro grinding—shaft speeds up to 10,000 r.p.m. depending on size and type of mill.**

These Mills assure uniform grind through advanced engineering features including (1) Improved ball bearings which center the shaft and minimize lateral whip and (2) Invar shafting with zero coefficient of heat expansion.

All Mills can be made with pressure feeds and jacketed hoppers.

Consult our Sales Department with your technical problems.

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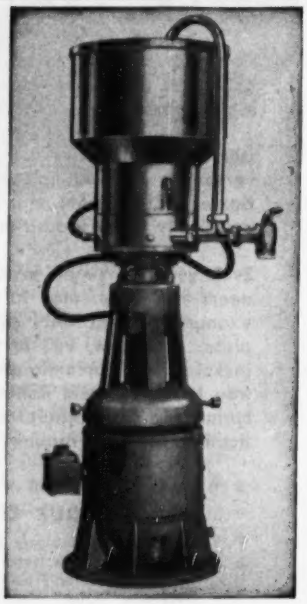

Direct-drive model shown operates at 3500 RPM.
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Colloid Mills made in all sizes from ¼ H.P. model laboratory size to 50 H.P. model.

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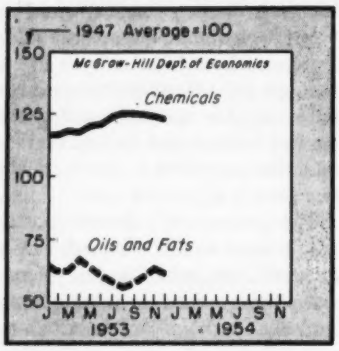
45-10 VERNON BOULEVARD
LONG ISLAND CITY, 1, N. Y.

THIS MONTH'S

Industry

PRICES...



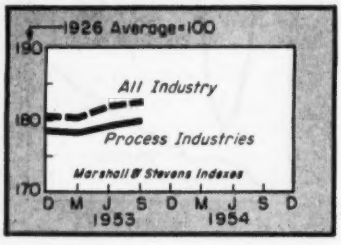
CHEMICAL ENGINEERING'S PRICE INDEXES

CHEMICALS.....124.5 –0.06%

OILS & FATS.....63.1 –1.0%

		Chemicals	Oils & Fats
As of	December 1, 1953	124.48	63.13
Last Month	November 1953	125.08	63.78
Year ago	December 1952	117.71	62.93
Two years ago	December 1951	120.94	71.12

EQUIPMENT COSTS...



ALL INDUSTRIES.....182.6 +0.26%

PROCESS INDUSTRIES....180.2 +0.26%

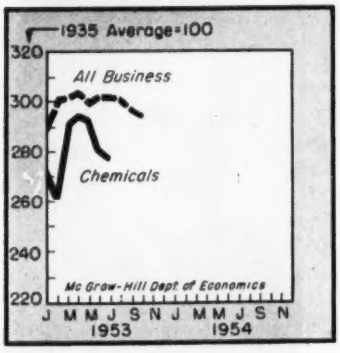
Industry	June 1952	Mar. 1953	June 1953
Average of all	180.3	180.7	181.9
Process Industries			
Cement mfg.	172.6	172.7	173.6
Chemical	181.0	181.1	182.0
Clay products	167.6	167.7	168.5
Glass mfg.	170.7	171.1	172.0
Paint mfg.	174.3	174.4	175.3
Paper mfg.	174.6	174.7	175.6
Petroleum ind.	177.4	177.8	178.7
Rubber ind.	179.8	180.2	181.1
Process ind. avg.	178.4	178.6	179.5
Related Industries			
Elec. power equip.	182.6	183.0	183.9
Mining, milling	181.7	182.1	183.0
Refrigerating	200.5	201.0	202.2
Steam power	170.3	170.7	171.6

Compiled quarterly by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. For a description of the method of obtaining the index numbers see R. W. Stevens, Chemical Engineering, Nov. 1947, pp. 124–6. For a listing of annual averages since 1913 see Chemical Engineering, March 1953, pp. 220, 221.

Trends

Douglas Greenwald

CONSUMPTION . . .



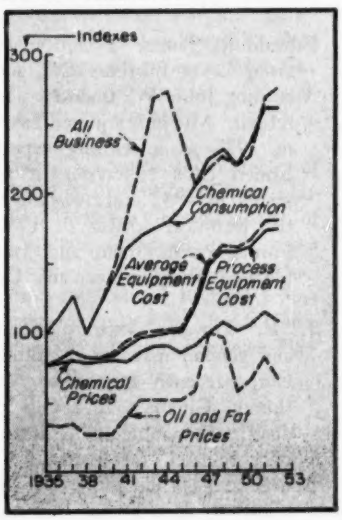
INDEX FOR ALL BUSINESS

	Oct.	Sept.	Aug.
INDEX	294.6	296.1	301.2

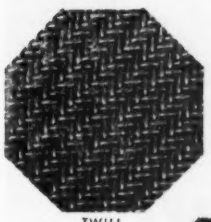
INDUSTRIAL CHEMICALS INDEX

	Oct. (Est.)	Sept. (Prelim.)	Aug. (Revised)
INDEX	270.0	265.6	278.3
Fertilizer		53.54	53.60
Pulp & Paper	32.88	30.13	31.77
Petroleum Refining	27.74	27.44	28.88
Iron & Steel	17.36	16.29	17.25
Rayon	26.70	26.90	30.82
Glass		23.25	25.68
Paint & Varnish		29.34	29.27
Textiles		9.95	10.75
Coal Products		11.05	12.35
Leather	4.02	4.10	4.37
Explosives		9.80	9.82
Rubber	5.94	5.92	5.90
Plastics		17.90	17.85

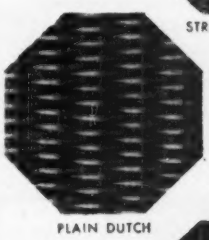
LONG TERM . . .



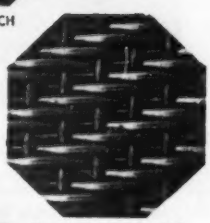
Newark Metallic Filter Cloth . . .

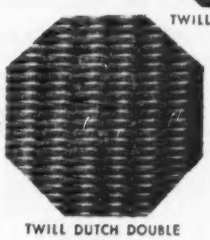

TWILL

STRANDED TWILL


PLAIN DUTCH

Enlarged approximately 3X


TWILL DUTCH SINGLE


TWILL DUTCH DOUBLE

Newark Metallic Filter Cloth does stop solids — the wedge-shaped openings allow only the filtrate to pass through. And, Newark Cloth is reversible, both sides being identical. Newark Metallic Filter Cloth is woven firmly and uniformly without loose wires, guaranteeing good filtration all over.

Newark Metallic Filter Cloth is available in a variety of weaves in *all* malleable metals, and is adaptable to practically all types of filters. When writing, please give us details on your process.

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Newark Wire Cloth COMPANY

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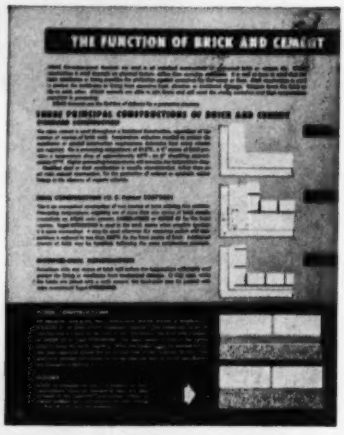
. . . a practical guide to Corrosion-proof cements

NEW, INFORMATIVE BULLETIN AVAILABLE WITHOUT OBLIGATION



HERE in concise form you will find complete data on the basic types of corrosion-proof cements and constructions. Each cement is graphically shown in its relationship to temperature and the broad classes of corrosives handled.

In addition, RESISTANCE TABLES are included which cover 176 common corrosives, and relate them to cements satisfactory for that service. And, ESTIMATING TABLES guide you in figuring not only cement, but also brick requirements for most corrosion-proof construction jobs.

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Corrosion-proof Cements . . . Coatings . . . Linings

THIS MONTH'S

Names in

Roger Adams

Head of the department of chemistry and chemical engineering at the University of Illinois and past president and past chairman of the board of directors of the American Chemical Society, Dr. Adams has been chosen to receive the highest award in American industrial chemistry, the Perkin Medal of the American Section of the society of Chemical Industry, for 1954, for outstanding achievement in applied chemistry. He has been head of the department at Illinois since 1926 and holds many medals and other honors awarded him as an outstanding scientist, teacher, editor and leader in professional organizations devoted to pure and applied science.

Edward M. James. Technical advisor, Lever Brothers Co., succeeding **John W. Bodman** who retired. Mr. James joined Lever in 1937 as a refining expert, named chief supervisor of research in 1942 and assistant to the technical advisor in 1950. Formerly with Proctor and Gamble and Sharples Specialty Co.

J. E. Troyan. Vice president and general manager, Matholin Corp., recently formed by Mathieson Chemical and Oil Industries to manufacture and conduct research on hydrazine, a new tonnage chemical with applications as a rocket fuel and

as a starting material for making a variety of other industrial chemicals. Mr. Troyan joined Mathieson in 1949 and was formerly manager of process development in its chemical research and engineering division. Previously with Phillips Petroleum and Gulf Research and Development. New assistant general manager: **Don W. Ryker,** with Olin for seven years, most recently as manager of hydrazine research.

Loring E. Harkness, Jr. Chief industrial engineer, plastics division, Celanese Corp. of America. Formerly with Dan River Mills and Aluminum Co. of America.

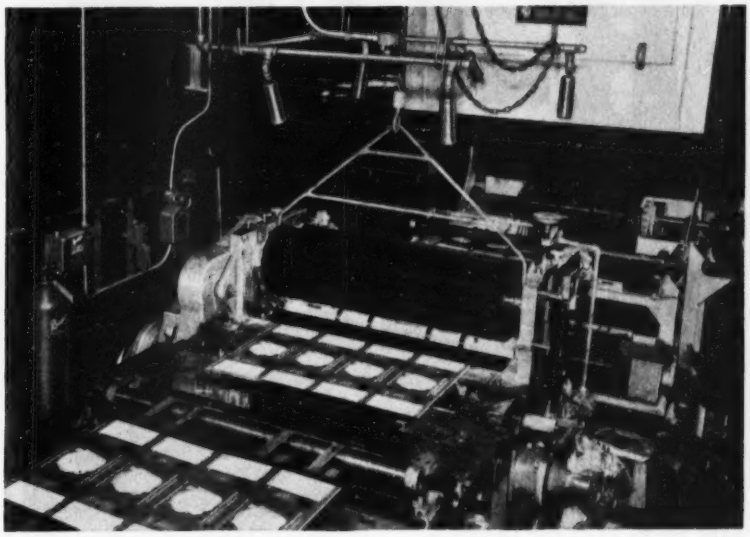
Albert W. Strahorn. Assistant chief engineer, Atlas Powder Co. His successor as manager of company's Giant explosives works at Richmond, Calif.: **Henry T. Clark,** formerly director of Volunteer Ordnance Works at Chattanooga, Tenn., operated for the government by Atlas.

Baline O. Schoepfle, Leopold A. Robillard, and **Samuel Gelfand.** New members of Hooker Electrochemical research and development staff. Dr. Schoepfle in the plastics and resins group; Mr. Robillard in the pilot plant development group; and Dr. Gelfand in the fluorine chemicals group.

Edward W. Smith, III. Director of sales, Marco products dept., plastics division, Celanese Corp. of America. With company since 1944. New director of production application: **Richard J. Savage,** formerly with Owens-Corning Fiberglas and Parmelee Plastics Co.

W. W. Knight, Jr. Vice president, Barrett Division, Allied Chemical & Dye. Formerly with Libbey-Owens-Ford Glass and Michigan Alkali.

SHERWIN-WILLIAMS INSTALLS RANDOLPH AUTOMATIC FIRE SYSTEM



The Sherwin-Williams lithographic equipment presented an unusual and worrisome fire hazard, but this Randolph Automatic System not only automatically detects and extinguishes any fire that might occur, but also shuts down the equipment.

Kills Fire, Sounds Alarm and Shuts Down Machinery

As in the Sherwin-Williams installation, Randolph Systems, in addition to automatically killing the toughest fires in split seconds, can also be equipped with duct and door closers, motor, fan and machinery shut-offs, warning alarms and other auxiliary safety devices. Systems are designed for both local application or total room flooding and are ideal for dip tanks, baking ovens, spray booths and hundreds of other applications.

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A Better Multiwall Valve Bag
FOR LESS!

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With Bemis B-FLEX Bags, you also get the same bonus you get with all Bemis Multiwalls—**BEMIS MULTI-COLOR PRINTING** . . . your brand at its finest on multiwall bags.

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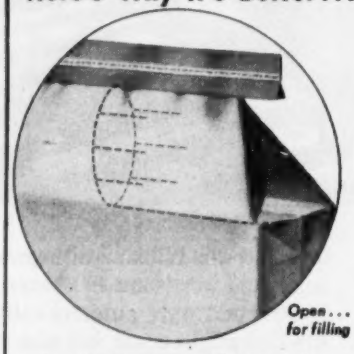
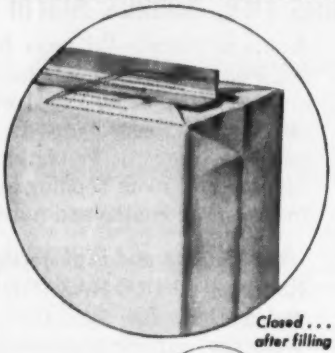
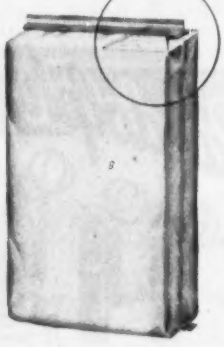


Open... for filling

The FLEX Does the Trick...



Closed... after filling



Bemis

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Sales Offices in Principal Cities

Chalmer G. Kirkbride

President and director of Houdry Process Corp. and director of Catalytic Construction Co. was elected president of the American Institute of Chemical Engineers. A graduate of the University of Michigan, he was first associated with the research dept. of Standard Oil Co. (Ind.) for four years before becoming the assistant director of research at Pan American Refining Corp. in 1934. In 1942 he joined Magnolia Petroleum Co. as chief of their chemical engineering development program. Following that, he was professor of chemical engineering at The A. & M. College of Texas from 1944 until 1947 when he joined Houdry. He has been an active member of A. I. Ch. E. since 1937 and a chairman and member of many committees as well as a representative of the Institute in other organizations.

Cecil W. Humphreys. Vice president in charge of manufacturing, Shell Chemical Corp. Formerly general manager and manager of development for company's manufacturing dept.

Winford Janes, Jr. Plant engineer at Hercules Powder Co.'s Savannah, Ga., plant. With company since 1947.

A. V. McMurray. Sales manager, Master Tank and Welding, Dallas, Tex. With company since 1948. Formerly co-owner of Edwards Co. in Tulsa, Okla.

C. M. Hickey. From general superintendent of plants in Consolidated Chemical Industries'

southern division to manager of manufacturing. With company since 1924.

Kenneth E. Knowles. Elected a vice president of Clapp & Poliak. With Du Pont prior to joining company in 1947.

William F. Jacobi. Manager of newly created multiwall machinery dept., Union Bag and Paper Corp. With company since 1946, most recently in market research dept.

Elmer J. Lell. Sales manager, Wall Colmonoy Corp., Detroit, Mich. With company since 1948.

Frank B. Nuelle. Manager, engineering administration section at General Electric's Carboloy dept. With company since 1951.

John E. Powers and **Howard M. Dodge.** Vice presidents, General Tire & Rubber. Powers was general sales manager of plastics and special products; Dodge is head of General's expanding mechanical goods division.

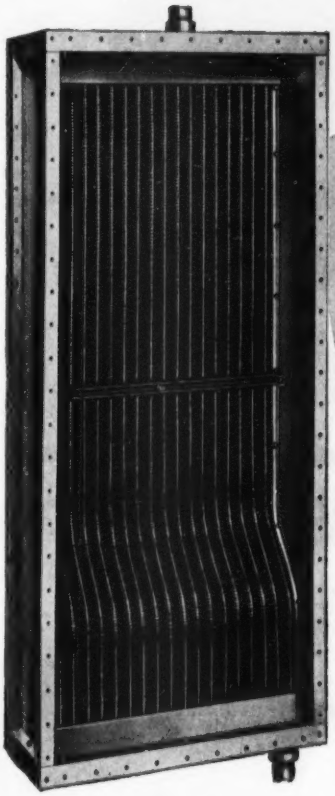
Gordon E. Lowe. Assistant plant superintendent at Hercules Powder Co.'s plant in Brunswick, Ga., succeeding **John M. Eagan,** assistant superintendent at Hercules' new Higgins plant in Gibbstown, N. J.

Robert P. Caruthers and **Morris Eisenberg.** New members of industrial chemistry staff, Stanford Research Institute. Mr. Caruthers was formerly with Reaction Motors and Magnolia Petroleum Co. Dr. Eisenberg has recently completed research on theoretical and experimental aspects of mass transfer in electrolytic cells and processes for production of manganese at the U. of California, Berkeley.

Walter B. Claus. Director of manufacturing, Consolidated Engineering Corp.'s newly reorganized transducer division. His successor as chief mechanical engineer: **Gerald S. Perkins.**

John W. Towler. Manager of Union Oil Co. of California's Oleum, Calif., refinery. Formerly

EFFICIENT *Extended-Surface* HEAT EXCHANGERS



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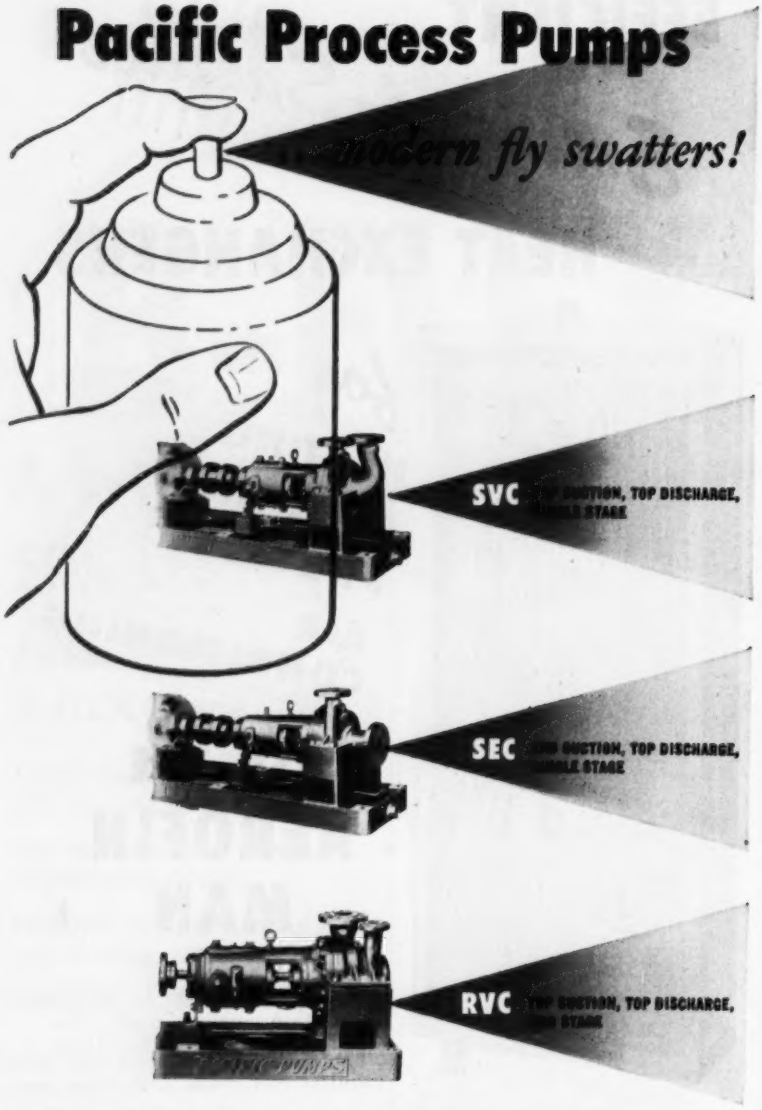
Pacific Process Pumps



★ Custom fabricated from properly chosen materials to perform their tough jobs, Pacific process pumps give a mighty assist in the production of insect sprays, detergents, antiseptics and a host of other products that safeguard health and give comfort to mankind . . . thus in a sense becoming "modern fly swatters." The widespread use of Pacific process pumps for heavy-duty assignments in the petro-chemical industry is conclusive proof of Pacific's ability to perform continuous service with sustained economy.

Pacific single-stage Types SVC and SEC handle liquids from sub-zero to 800°F., 15 to 1,600 gpm, 500 to 600 psig, discharge pressure, differential heads up to 600 feet, speeds to 4,000 rpm. Two-stage Type RVC pumps liquids from sub-zero to 850°F., 50 to 600 gpm, discharge pressure to 600 psig, differential heads to 825 feet, speeds to 3,600 rpm. For further details, write for Bulletins 101 and 108.

PACIFIC *Precision Built* PUMPS

Pacific Pumps inc.

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NAMES IN THE NEWS, *cont. . .*

chief engineer at firm's Wilmington refinery. New manager at Wilmington refinery: **Henry C. Meiners,** formerly manager of Oleum refinery.

Wentworth Brown. Vice president and general manager, Columbia Cellulose Co. of Prince Rupert, B. C. Formerly with Brown Corp. of Berlin, N. H.

E. C. Uecker. Sales manager, water distillation div., Cleaver-Brooks Co. With company since 1951. Formerly with Young Radiator and General Electric.

John Philip Boksenbom. President of American Dyewood Co. and New York Color and Chemical Co., subsidiaries of United Dye and Chemical Corp. Formerly with Radio Corp. of America and Union Carbide and Carbon.

Maurice E. Bailey and Cecil A. Friedman. Group leaders in research and development dept., National Aniline Division of Allied Chemical & Dye Corp.

William C. Rindsland. Resident engineer of Rayonier's Jesup, Ga., plant. Formerly resident engineer at company's Fernandina, Fla., plant. Previously with U. of Minnesota, Appraisal Service Co. and Minnesota and Ontario Paper Co.

William F. Waldeck. Director of research and development, Wyandotte Chemicals. With company since 1939. Formerly with Columbia Chemical Division of Pittsburgh Plate Glass.

Jack W. Harris. Sales engineer, Beaumont Iron Works. Formerly with Cameron Iron Works, Gulf Refining, J. S. Ambercrombie, and Harrison Oil.

Joseph Ohzourk. Factory manager, Chicago die mold plant of U. S. Rubber. Formerly an administrative assistant.

Ralph N. Lulek. Elected a director and vice president of manufacturing and research, Grace Chemical Co. Formerly a direc-

tor and vice president of Heyden Chemical Corp. and of St. Maurice Chemical Ltd.

Richard M. Paget. Senior partner in Cresap, McCormick and Paget, elected a director of Atlas Powder Co.

B. W. Haskell. Resident engineer, Fernandina division of Rayonier Inc. With company since 1946 and formerly with General Electric.

Ely Balgley. Supervisor of new product development, market development dept., Heyden Chemical Corp. With company since 1950.

Paul G. Bird. Director of research and development, Wright Chemical Corp. Formerly with National Aluminate Corp. and Iowa State College.

P. W. Bakarian. Plant manager of Cramet Inc., wholly owned subsidiary of Crane Co., now under construction at Chattanooga. Formerly with Dow Chemical, Almag Engineering Co. Ltd.

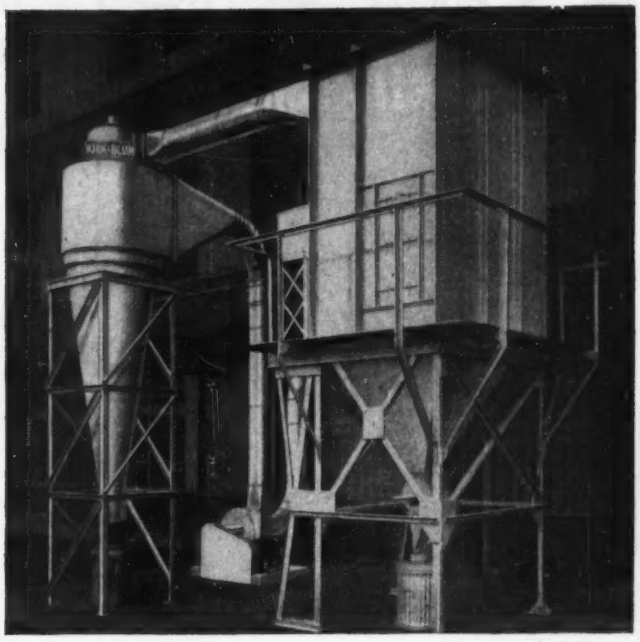
John H. Wishnick. Vice president in charge of production, Witco Chemical Co. His successor as superintendent of company's Chicago plant: **John V. Roach,** with Witco since 1948. Formerly with Du Pont's Grasselli Chemicals Division.

John H. Gould. Maintenance superintendent, Monsanto Chemical Co.'s phosphate division plant at Anniston, Ala., succeeding **R. L. Neubert,** now maintenance superintendent of company's plant at Monsanto, Tenn. Mr. Gould was formerly with Colgate Palmolive Peet, U. S. Gypsum, and Joseph E. Seagram and Sons.

Clarence T. Kasline. General Sales manager, Torsion Balance Co. With company for 17 years.

R. O. Bair. Superintendent of Rubarite, Inc.'s new plant at Malvern, Ark. Rubarite is owned jointly by Goodyear Tire & Rubber, National Lead, and Bird & Son.

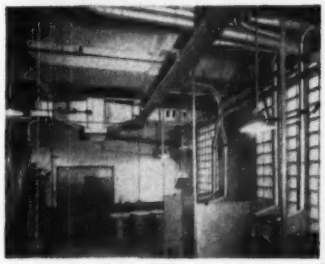
Two-stage air cleaning: high efficiency centrifugal collector (at left) plus cloth media filter.



pharmaceutical manufacturer finds

KIRK and BLUM DUST CONTROL

"just what the doctor ordered!"



To maintain rigidly controlled and conditioned plant atmosphere, air returned from cleaning operation is heated or cooled as required.

To insure, in all manufacturing steps, the purity of The Wm. S. Merrell Company's products, Kirk & Blum Dust Control Systems were installed by this well known pharmaceutical manufacturer. Dust is eliminated at its source to meet the plant's strict requirements. Since the building is air conditioned, cleaned air is tempered (warmed or cooled) before it is returned to the plant.

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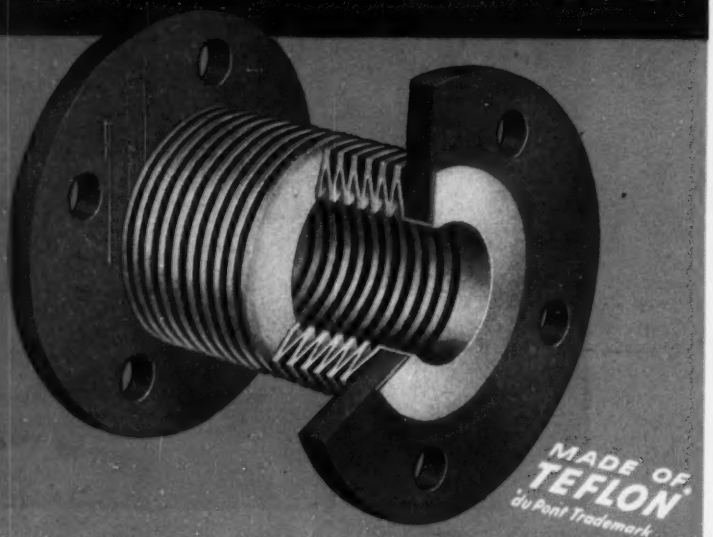
SAFE SEALS
for Costly Chemical Piping



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- Absorb shock, vibration, thermal expansion and contraction.
- Correct misalignment.
- Connect unlike piping ends and nozzles.
- Eliminate gaskets, adaptors, slip joints.
- Made of TEFLON*—impervious to all chemicals except molten sodium and fluorine.
- Write for Bulletin FC-952

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R. P. Dinsmore

Dr. Ray P. Dinsmore, vice president in charge of research and development of the Goodyear Tire & Rubber Co., recently received an honorary membership in the National Council of the American Institute of Chemists from Dr. Lincoln T. Work of New York City, president of the national council. The Ohio Chapter of the Institute named Dr. Dinsmore to receive the annual award for his contribution to the advancement of chemistry. Dr. Dinsmore is widely known for his writings on synthetic and other rubber subjects and is a frequent lecturer to scientific groups.

G. A. Webb. Assistant to the manager, research dept., Koppers Co. Affiliated with company since 1941.

James A. Loftus. Production manager, Precision Scientific Co. With company since 1935.

Walter T. Meinert. Assistant director of development and service dept., Emery Industries. With department for past four years.

T. E. Alwyn. Vice president elevated to executive dept., American Can Co., to work in overall administration of company. His successor as vice president in charge of sales: **D. B. Craver,** with company for 25 years.

Walter A. Henson. In charge of new development and service section in coatings technical service, plastics dept., Dow Chemi-

cal. His successor as head of paint section: **Fred K. Quigley, Jr.**, head of Dow's technical service and development activities in the textile industry since 1948. New head of textile section: **Manson C. Carpenter,** with company since 1949.

Howard A. Sumner. Vice president and director appointed special assistant to the president, Norwich Pharmacal Co. With company for 34 years.

Emil Hladky. Assistant chief chemical engineer, Calco chemical division, American Cyanamid Co. New chief chemist in the chemicals dept.: **T. S. Leary.**

F. Otto Haas. Executive vice president, Rohm & Haas Co. With company since 1939 and a director since 1948.

William T. Ries. Production manager of American Cyanamid Co.; Calco chemical division's Newark, N. J., plant. Continues as production manager of Calco's rubber chemicals and pharmaceutical depts. at Bound Brook, N. J., plant. With company since 1936.

Milton Rabinowitz. Vice president and general manager, First Machinery Corp., New York City.

P. G. Murdoch. Technical expert in organic research dept., Dow's Texas division, at Freeport, Tex. Formerly at Texas A & M College.

Robert G. Splies. New member of research staff of Bjorksten Research Laboratories. Formerly with Solvay Process Division and Wisconsin State College.

Theodore Marvin. President, elected chairman of board of directors, Michigan Chemical Corp. Formerly with Hercules Powder Co.

Lester G. Lundsted. Director of chemical research, Wyandotte Chemicals Corp. With company since 1942, most recently as assistant to the director of research.

WE TAMED EXPLOSIVE FUMES
with this centrifugal
AN A.T.&M. SUCCESS STORY BY SAM SPINNER
THE FUMES FROM THAT CHEMICAL ARE SO VOLATILE WHEN WE CENTRIFUGE IT, SAM, THAT JUST STATIC OR OVERHEATING WILL EXPLODE THEM!
I KNOW THE CURE FOR THAT!
BUT THAT'S NOT ALL, SAM! ANY METALLIC FRICTION WHICH WOULD NORMALLY TAKE PLACE IS DANGEROUS AND MUST BE ELIMINATED.
I CAN CURE THAT, TOO!
LATER
THE FUME-PROOF HOOD ON THIS STANDARD AT&M MACHINE WILL SEAL FUMES IN-TIGHTER THAN A DRUM. AND—
WE DEVELOPED A SPECIAL TWO-SPEED SELF-BRAKING MOTOR JUST FOR YOUR PARTICULAR PROBLEM WHICH COMPLETELY DOES AWAY WITH THAT FRICTION YOU WORRIED ABOUT. YOU'RE IN THE CLEAR —SAFE AND EFFICIENT!
FREE ILLUSTRATED BOOKLET
AMERICAN TOOL & MACHINE COMPANY
1415 Hyde Park Avenue, Boston 36, Mass.
Please send me my free copy of the new AT&M booklet "Centrifugal Force." I am interested in the following processes:
Separation ☐ Extraction ☐ Dehydration ☐ Clarification ☐ Coating ☐
Filtration ☐ Draining ☐ Thickening ☐ Impregnation ☐ Sedimentation ☐
ANY OTHER PROCESS.....
SAVE TIME, SPACE AND COSTS WITH
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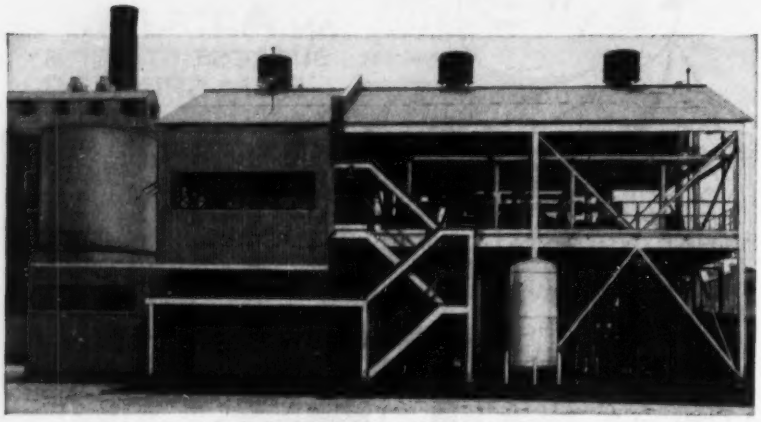
NEW FA* PLANT

Keeping Ahead of Industry's Demand

MORE QO FURFURYL ALCOHOL!



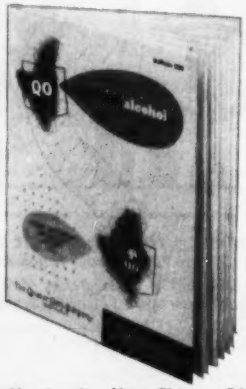
New Furfuryl Alcohol Plant, Memphis, Tennessee

Quaker Oats is happy to announce the opening of its new plant at Memphis, Tennessee for the production of furfuryl alcohol. The new plant is designed for the manufacture of a high quality product and is so sized that it further improves the good availability outlook on this chemical.

This is good news to the growing number of industries which have found FA useful in the manufacture of a wide variety of products including resinous mortars, cements, binder resins, grinding wheels, textiles (furfuryl alcohol is used as a solvent for the dyes required in the printing operations), and in craze resistant gap filling urea adhesives.

FA is derived from agricultural residues—the abundant supply of which is renewed annually. Now, with the new processing facilities, more and more industries can profit from the advantages of using furfuryl alcohol.

How about your product—have you investigated FA? Send for Furfuryl Alcohol Bulletin 205.



*Reg. U. S. Pat. Off.

The Quaker Oats Company
CHEMICALS DEPT.

335R The Merchandise Mart, Chicago 54, Illinois
Room 535R, 120 Wall St., New York 5, N.Y.
Room 435R, P. O. Box 4376, Portland 8, Oregon
In Europe: Quaker Oats-Graanproducten N. V., Rotterdam, The Netherlands;
Quaker Oats (France) S. A., 3, Rue Pillet-Will, Paris IX, France
In Australia: Swift & Company, Pty., Ltd., Sydney
In Japan: F. Kanematsu & Co., Ltd., Tokyo

THIS MONTH'S

Man of

CROSBY FIELD

An "engineer's engineer," he has just been awarded the ASME Medal.

Take the most accomplished chemical, mechanical, electrical, and refrigeration engineer you know. Throw in a prodigious inventor, a top-flight executive, a wise counsellor and an indefatigable worker. Roll them all into one and you have Crosby Field, this year's ASME Medalist.

One of the best characterizations of Crosby Field was recently given by Ted Olive, *Chemical Engineering*'s Senior Associate Editor. Ted tells about the time he first met Field some twenty-five years ago. An associate was escorting Ted to Field's office. In the course of the conversation, the associate said: "You know, Mr. Field is a remarkable electrical engineer."

Later the conversation turned to a mechanical process and the associate again remarked. "You know, Mr. Field is a remarkable *mechanical* engineer."

Still later, they began to talk about a chemical process. Again—and still without realizing that he was making some very unusual statements—the associate said: "You know, Mr. Field is a remarkable *chemical* engineer."

"And that," adds Ted Olive, 25 years later, "is the way to characterize Crosby—*Engineer*!"

the Month

H. T. Sharp

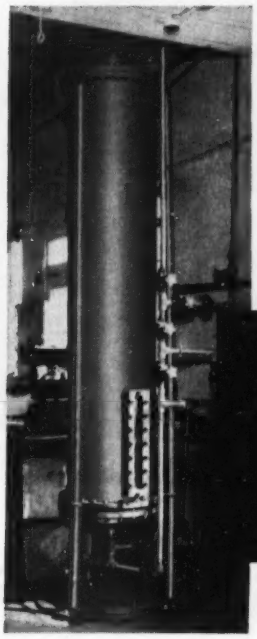
The truth of that statement is documented in over 100 patents—electrical, mechanical, chemical, and refrigeration. Working with the great Steinmetz at GE, he developed the Oxide Film Lightning Arrester and received several other electrical patents. In recognition, he was elected to the grade of Fellow in the American Institue of Electrical Engineers in 1922 at the age of thirty-three.

His achievements as a chemical and mechanical engineer are even more impressive but space will not permit even an outline of them here. He is best known for the invention of Brillo manufacturing equipment and the FlakIce machine. In the case of Brillo, the production of low-cost steel wool (one of Field's machines did the work of 250 of the machines it superseded), revived old and exploited new markets and created employment for many. In the case of FlakIce, Ice Makers, Field's ingenious invention, first of the small-ice machines, made possible the extended small-ice industry of today. Field received 27 patents for turning out frozen water ribbons. As part of this work, he also made one of the World's most extensive surveys of the ice market. From 1923 he has been president of his own company, the Flakice Corporation. His activities can best be summed up by a casual remark one of his associates recently made: "He knows more about ice than Jack Frost."

But Field's ability, versatility and non-conformist nature have not found total expression in industry—not by a long shot! He has rendered unusual and outstanding service to his country as a scientist and Army officer. Field is the sort of man who wins top plaudits for his tireless and superior service and then goes out and roundly damns the caste system of the Army. Because of his technical ability, he was a munitions expert in both World wars. In World War I, he racked up an unprecedented inspection record in the loading

Barnstead

MIXED BED DEMINERALIZERS



10 TO 2500 GALLONS OR MORE PER HOUR

PURE MINERAL FREE WATER

In 3 years of operation, this 500 gallon per hour Barnstead Demineralizer has produced over 4 million gallons of high purity demineralized water with a minimum of maintenance or attention.

The sturdy construction and simplified design, plus the new and improved regeneration system make the Barnstead Mixed Bed Demineralizers outstanding in performance.

Easy to operate — easy to regenerate — they produce ion-free water at very low cost, and with a Barnstead Mixed Bed you get more gallons between regenerations.

Each unit is complete with regenerant tanks, flow meter, pressure gage, purity indicator, and simplified regeneration. Steel columns are lined with heavy sheet rubber.

Just Released

BARNSTEAD'S NEW DEMINERALIZER CATALOG #127

Profusely illustrated with detailed descriptions, specifications of the latest BARNSTEAD mixed-bed, two-bed, and 4-bed Water Demineralizers. WRITE FOR YOUR COPY TODAY!

Ask for Barnstead Pure Water Recommendations—Without Charge

Our engineers will gladly submit recommendations, specifications, operating cost figures, and performance data. Since Barnstead builds Mixed Bed units, Two- and Four-Bed Demineralizers, and a complete line of Distilled Water Equipment, you are assured of unbiased advice.

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75 Years of Progress in Pure Water 1878 1953

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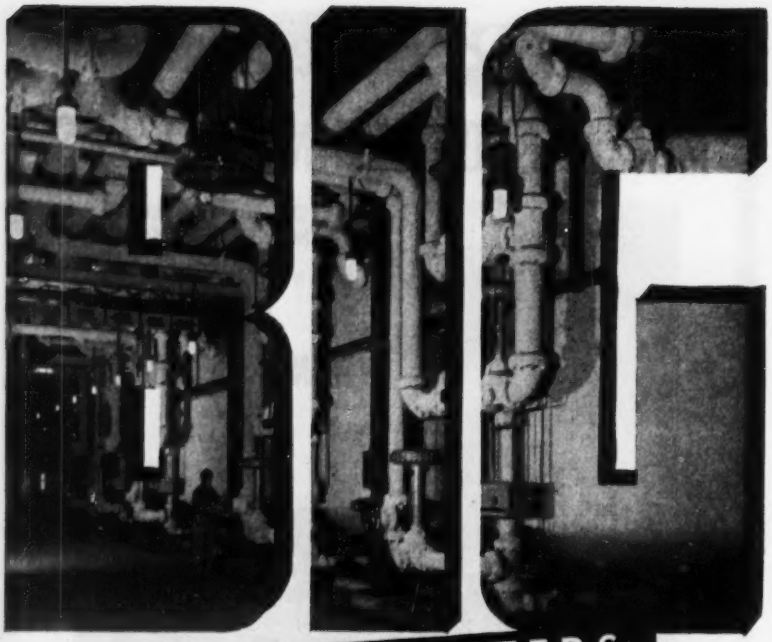
Barnstead STILL & STERILIZER CO.



BIG

DEMINERALIZERS

USE

Nalcite® (DOWEX*) ION EXCHANGE RESINS

THIS demineralizer, one of the world's largest, provides 100% makeup for 1250 psi boilers generating 1,200,000 pounds of steam per hour. Using Nalco ion exchange resins, Nalcite HCR* and Nalcite SAR, silica is successfully removed from the feedwater—as illustrated by the fact that after 75 to 100 concentrations, silica content of the boiler water is still *less than 5 ppm!*

In demineralizers large or small, Nalcite ion exchange resins give top performance. They are chemically and physically stable for long life at top efficiency. *Two* Nalcite anion exchangers . . . your choice of SAR or SBR . . . are available to meet the conditions of your water supply. Either, used with Nalcite HCR, offers top quality demineralized makeup for high pressure steam generators.

DATA ON SILICA REMOVAL

A new edition of Nalco Bulletin 57 gives technical data on Nalcite SAR and Nalcite SBR anion exchangers . . . includes complete up-to-the-minute information on silica removal. Write for your copy today.

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Nalco®

PRODUCTS • *When you use Nalcite resins, you take advantage of Nalco's long and broad experience in water and process technology.*

of explosives. In World War II, as an Army Colonel, he performed an amazing sort of scientific detective work. As one of many duties he studied the ruins of accidental explosions to find the causes. The denouement of this work was published in a series of articles appearing in *Chemical Engineering* right after the war.

Throughout his entire life Crosby Field has been a strong believer in the importance of engineering science to the advancement of industry and the importance of small privately-owned manufacturing plants as a factor in the American economy.

Mr. Field has written extensively about his engineering accomplishments and about his philosophy of the development of American industry.

Field is one of the country's great champions of small business and industry.

In 1923, after considerable soul-searching, he came to two conclusions:

"1. That if our American form of society were to continue, with its emphasis on individual freedom and free enterprise, a large percentage of all manufacturing plants (and other types of business) must continue to be small and privately owned; i.e., owned by a few individuals; one or more of the owners to be active in the management," and

2. That small industry was the place for Crosby Field to exert his best efforts.

He immediately cut short a promising career as engineering manager of National Aniline and became vice president in charge of production and development, and manager of all factories of the Brillo Manufacturing Co., Inc., and concurrently an officer and director with management control of other organizations, among them: Chemical Machinery Corporation, Flakice Corp., Murfield Garage, Inc., Crosby Field, Inc.

These are just a few mentions from the brilliant career of Crosby Field. It is near-impossible to do him justice in these few columns; an ambitious biographer would have to look far to find a richer subject.

Frederick M. Pyzel. Consulting chemical engineer, Fluor Corp. Formerly with Shell Chemical and Foster-Wheeler.

Harald S. Julsrud. Sales manager, Alkydol Laboratories. Formerly with Archer-Daniels-Midland and Procter and Johnson, Chicago agents for ADM.

Andrew A. Root. New staff member at Frederick S. Bacon Laboratories. Formerly with MIT, Inland Steel Corp., and the research division of United Shoe Machinery Corp.

DeWitt L. Morris. Superintendent of Freeport Sulphur Co.'s new plant at Garden Island Bay in the Louisiana marshland. With company since 1937. New production superintendent: **Paul L. Bybee,** former production superintendent at Freeport's Hoskins Mound mine in Texas.

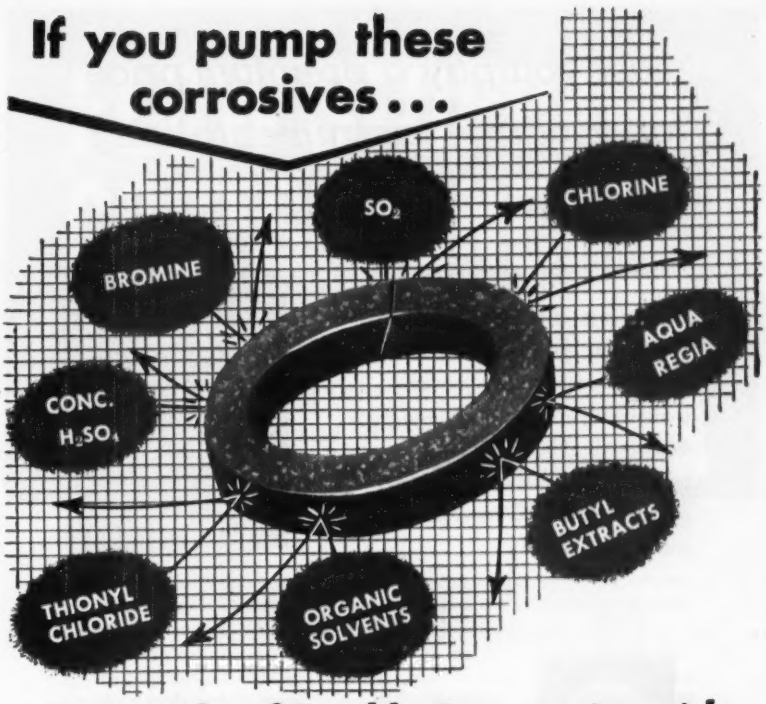
Alex Stewart. Vice president, director and general manager of National Lead Co. of Ohio, contract-operator of Atomic Energy Commission plant in Fernald, Ohio. He continues as director of research for National Lead Co.

Harry E. Kaiser. Technical Director of Pabco Products, Inc. With company since 1951, most recently as chief development engineer. Formerly with Hercules Powder Co.

Elwyn E. Winne. Elected a vice president and director of Grace Chemical Co. With company since 1948. New directors: **William R. Thurston,** president of Thurston Chemical and Naco Fertilizer Co., and **John T. Whitely,** assistant vice president of W. R. Grace & Co.

Otto L. Hoffman. Director of new biological research section, Spencer Chemical Co. Formerly in company's agronomy section. Previously with U. S. Rubber.

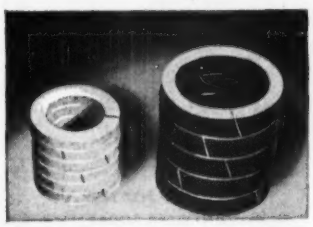
W. H. Louviere. President of Imperial Sugar Co. Joined company in 1947 as assistant vice president and elected a director in 1950.



Get months of Trouble-Free service with

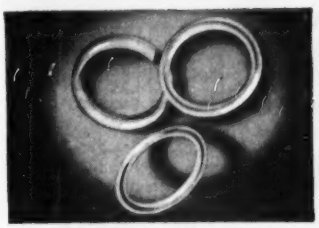
CHEMPRO TEFLON PACKINGS

If your pumps and valves handle highly corrosive industrial chemicals, CHEMPRO TEFLON PACKINGS will drastically cut packing replacement and maintenance costs. CHEMPRO Packings *last for many months* under corrosive conditions which make ordinary packings useless in days or even hours. They stop leakage by providing a tight seal at only slight gland pressure, and their very low coefficient of friction often makes lubrication unnecessary.



TEFLON* PLASTIC STUFFING BOX PACKING

Ideal for either centrifugal or reciprocating pumps operating at speeds up to 3600 R.P.M. handling corrosives at temperatures from -118° F. to 525° F. Style No. 101 composed of 94% shredded Teflon and chemically inert graphite as a friction reducer. Style No. 201 same as No. 101 except that mica is used as friction reducer. Both styles made to fit every size stuffing box on standard process equipment.



TEFLON V-TYPE PACKINGS

For reciprocating pumps and hand, air and motor operated valves handling corrosive materials. Lips of very sensitive pressure rings expand proportionately to increased operating pressure thereby preventing leakage. Suitable for temperatures from -150° F. to 550° F. Unsuitable for centrifugal or rotary pumps. Supplied in bulk or in complete sets to fit specific stuffing boxes.

Chemical & Power Products engineers are packing and gasket specialists with complete fabricating facilities to meet your specific requirements. Write for our complete Teflon Packing and Gasket Catalog.

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CHEMICAL & POWER PRODUCTS, INC.

The Original Fabricators of Teflon Packings and Gaskets

11 Broadway, New York 4, N. Y.

must you pay a premium price for accurate instrumentation?

fielden says, "no!"—

with precise yet sensibly priced instruments like this TELSTOR Electronic Level Indicator. TELSTOR measures continuously—with accuracies to ±2%—the levels of liquids, viscous fluids, powders or granular solids. Remote readings can be recorded at distances greater than one mile.

Fielden TELSTOR Electronic Level Indicator for Accurate, Continuous Level Measurement of Liquids or Divided Solids.

Simplification is the reason for Fielden's economical instrumentation. TELSTOR, for example, has no moving parts—no floats to stick or leak—no pneumatic or hydraulic piping. Circuitry is simplicity itself and only one vacuum tube is employed. Measuring electrode and instrument are easily installed.

Unless you really *need* instrumentation of *extreme precision* (which inevitably costs more) get the facts about Fielden. *Simplified* Fielden instrumentation assures *all the accuracy you can use*—at an extremely worthwhile saving in initial cost and maintenance.

DOLLAR FOR DOLLAR—YOUR BEST INSTRUMENT VALUE

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SEND FOR NEW INSTRUMENT DATA TODAY.

INSTRUMENT DIVISION

ROBERTSHAW-FULTON CONTROLS COMPANY
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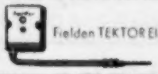
Send full details of Fielden simplified ☐ TELSTOR Electronic Level Indicator ☐ TEKTOR Electronic Level Control ☐ TEKTOLOG Electronic Recorder.

*Name*_____

*Title*_____

*Company*_____

*Address*_____ *City*_____ *State*_____



Fielden TEKTOR Electronic Level Control

Fielden TEKTOLOG Electronic Recorder

NAMES IN THE NEWS, *cont. . .*

James R. Bradburn. Vice president in charge of Consolidated Engineering Corp.'s computer division. With company since 1945. His successor as vice president in charge of engineering: **Joseph H. Lancor, Jr.,** formerly director of the company's transducer division.

J. C. Crowder. General superintendent, southern division, Consolidated Chemical Industries. With company since 1927, most recently as manager of Fort Worth, Tex., plant.

August Napravnik. Manager, new products division, Catalin Corp. of America. Formerly with the chemical division of Borden Co., and earlier with Catalin Corp.

Edgar L. Patch. General manager, Armour Laboratories. With company since 1951. Previously with E. L. Patch Co.

L. W. Moore. Elected first vice president of Pan American Petroleum & Transport Co. Continues as president and director of Pan American Refining Corp. and Mexican Petroleum Corp. of Ga., and director of Pan American Gas Co. and Pan American Production Co. Joined parent company, Standard Oil Co. (Ind.) at its Whiting, Ind., refinery in 1933.

M. C. Hopkins. From technical director of research and development at Pan American Refining Corp. in Texas City, Tex., to plant manager of new refinery at Yorktown, Va. With company since 1937.

W. S. Peeler. From operating superintendent to general superintendent of Texas City, Tex., plant of Pan American Refining Corp.

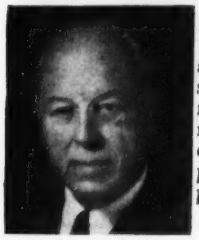
G. G. Edwards. Plant engineer, Cornwell Chemical Corp., Cornwells Heights, Pa.

William D. Mains. Vice president in charge of sales, Graham Manufacturing Co. With company since 1946.

Noel A. Pease. Manager of manufacturing for fibre drum plants of Continental Can Co.'s fibre drum division. With Continental since 1928, most recently as manager of St. Louis fibre drum plant.

Wilfred G. Schneider. Vice president in charge of manufacturing, Cuno Engineering Corp.

EAVESDROPPING



"The chemical age can be, and should be, the fulfillment of mankind's age-old dream of peace and prosperity."

Charles S. Munson*

Throughout the world, there are vast areas that are sometimes described as underdeveloped. Given a reasonably favorable climate of international relations, many of these underdeveloped areas could, in a relatively short period of time, become highly productive.

To mention only the agricultural possibilities, there could be a great increase in the food supply of the world through the development and increase of agricultural production in these areas—and this would mean, almost immediately, greatly increased demand for a host of other products. More important, it would mean that the tragically large portion of the earth's population which is underfed would get the chance to become really alive and contribute their share to progress. Given that chance, those people could appreciate the meaning of liberty which perhaps escapes them today in their struggle for bare existence.

The challenge and the possibilities are incalculable. But, unless we meet the challenge with real foresight and wisdom, our ventures in this field may rebound to our detriment rather than our advantage. Whether the challenge will be met and the possibilities realized depends in large degree on the wisdom and prudence of the policies pursued by the people of the United States. Here applied chemistry must walk hand-in-hand with applied and practical democracy.

*Chairman of the Board of Air Reduction Co. and the Manufacturing Chemists' Association upon receiving the Chemical Industry Medal for 1953.

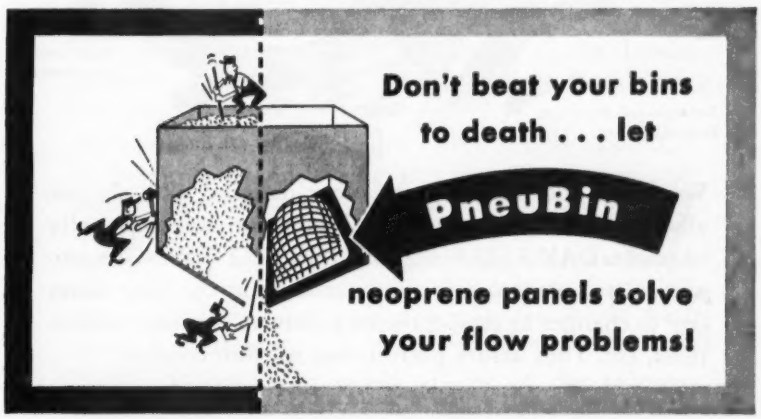
FLOW STOPPAGE COSTS MONEY!

Have you ever figured how much flow stoppage costs you in:

- **LOST STORAGE CAPACITY?**
- **LOST MAN-HOURS?**
- **LOST PRODUCTION TIME?**

PneuBin will solve your flow stoppage problems and help reduce your operating expense. When materials hang-up in your bins and hoppers, PneuBin starts them flowing again. The PneuBin unit consists of a steel-backed neoprene panel, mounted on the inside wall of your bin. By the pnuematic inflation and deflation of the panel, the bin contents are displaced and disturbed to activation. After the diaphragm has collapsed, the air control unit (operating off the regular plant air supply) starts another cycle of inflation and deflation. The process continues automatically at whatever frequency is set on the air controller.

Because the neoprene panel is resistant to oils and most chemicals and is also thick and tough enough to withstand severe abrasive service, PneuBin is applicable to most any bin flow problem.



Sizes: PneuBin panels are available in 14 standard sizes, 4" to 24" wide, 6" to 72" long. Special sizes can be made if required in quantity.

Send for "Flow Stoppage Report" and free literature. PneuBin engineers will gladly make recommendations, with no obligations on your part.

PneuBin is a product of
GEROTOR MAY CORP., Baltimore 3, Md.

Manufacturers of **GEROTOR** HYDRAULIC PUMPS & MOTORS

To manufacturers who have dust problems...this announcement is of the utmost importance.

DAY Type "AC" (reverse jet) Dust Filters are now being furnished with SELF-ADJUSTING BLOW RINGS, made under DAY and Hersey patents. This DAY improvement, to an already efficient dust filter, is now offered to industry after months of study and operation.

Wool felt and probably any other material with similar efficient filtering characteristics is inherently dimensionally unstable. DAY'S SELF-ADJUSTING BLOW RINGS automatically compensate for any variation in the filter tubes due to changes in temperatures, pressures, moisture conditions, etc. They assure perfect ring to cloth contact.

If you have a dust problem write toDAY for Bulletin 528-R.

The DAY Company

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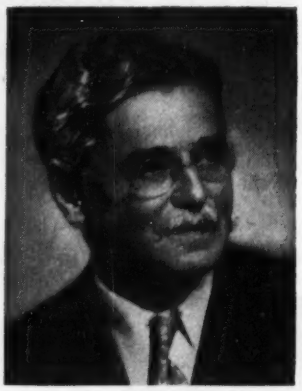
Branch Plants in Buffalo, Ft. Worth and Welland, Ont.

DAY SINCE 1881 DUST CONTROL
A SINGLE UNIT OR A COMPLETE SYSTEM

OBITUARIES



Gaston F. DuBois

Prominent consulting engineer and former officer and director of Monsanto Chemical Co., died November 1 in St. Louis at the age of 73. Born in Switzerland, he received a degree in chemical engineering from the Federal Polytechnic Institute at Zurich in 1903 and then took a postgraduate course in electrochemistry at the Technische Hochschule in Dresden, Germany. In 1904 he joined the newly-formed Monsanto Chemical Company as the third member of the young company's management, and continued that connection until his retirement in 1945. During those years he contributed to practically every technical development of the company and its subsidiaries. He was production manager from 1913 to 1920 when he was named vice president and technical director. He agreed to serve as president of Monsanto from 1919 to 1923, when he returned to directing the company's technical activities. In 1930 he was made vice president in charge of research and development and became a member of the company's Executive Committee in 1939. DuBois retired in 1945 but remained as a member of the company's Board of Directors until 1949. Recognized as one of the foremost figures in the development of the American chemical industry, DuBois was the recipient of many awards, culminating in 1943 in the Perkin Medal.

Isaac Herbert Kempner, Jr., 47, president of Imperial Sugar Co., died in Houston on October 20.

Herbert D. Tietz, 55, manager of sales of Inco nickel alloys dept., International Nickel Co., died on October 11.

Sherwin P. Lowe, 59, vice president and general manager of Tin Processing Corp., died in Galveston, Tex.

Otto C. Lott, 54, superintendent of the Gulf refinery acid plant in Port Arthur, Tex., died on October 13 in Port Arthur. Formerly with Dow Chemical at Freeport, Tex.

William Jonson, 70, founder and president of Destruxol Corp. of Pasadena, Calif., and an expert on agricultural sprays and soil conditions, died on October 15.

Arthur C. Ewer, manager of the Brooklyn plant of Bemis Bro. Bag Co., died October 19. With company over 53 years.

Clayton A. Wolfe, 60, vice president of Monsanto Chemical Co. and director of its purchasing and traffic dept., died in St. Louis, Mo., on October 20.

Walter W. Pitann, 66, chairman of the board and founder of Precision Scientific Co., died in Chicago.

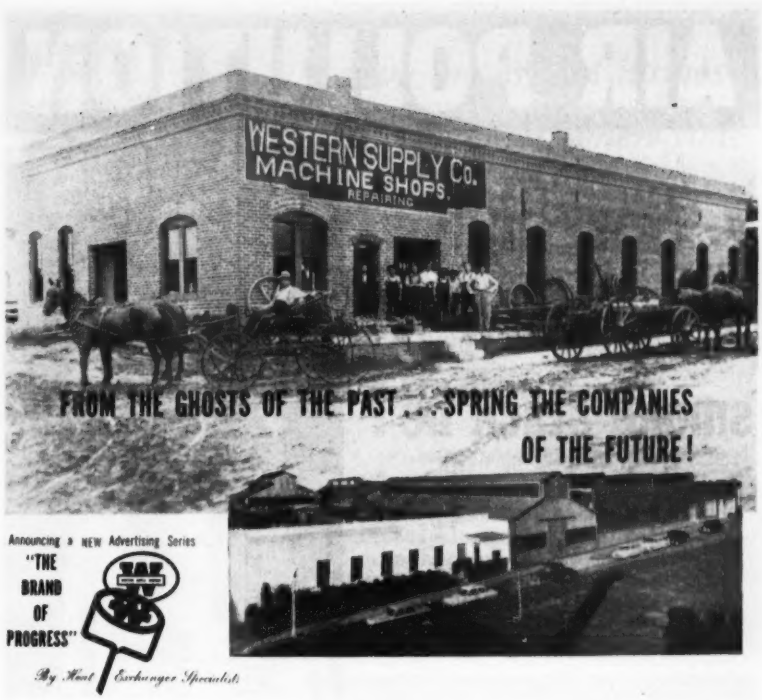
David J. Roach, 66, director and assistant to the president of Great Western Sugar Co., died October 23 in Greeley, Colo. With company since 1908.

Emmett Henry McFarland, 55, vice president and general manager of Freeport Sulphur Co., died October 23.

W. Earle Shumway, manager of sales engineering at Norton Co., died October 25. With company since 1917.

George M. Stratton, 72, retired manager of Morton Salt Co., died October 26 in Los Gatos, Calif.

Harry Jennings Crawford, 86, director and chairman of the board of Quaker State Oil Refining Corp., died November 3 in Oil City, Pa.


WESTERN SUPPLY Co.
MACHINE SHOPS
REPAIRING
FROM THE GHOSTS OF THE PAST . . . SPRING THE COMPANIES OF THE FUTURE!
Announcing a NEW Advertising Series
"THE BRAND OF PROGRESS"
By Heat Exchanger Specialists

▲ It was 1909 when the photographer squeezed the bulb on his camera and film-recorded the top photograph. Western Supply Company, a small machine shop engaged in the repair of cable-drilling tools, had been in business for three years. At that time there were no gleaming rails to the South of the infant company and machinery was delivered by buckboard over muddy, rutted streets.

But both the Southwest and Western Supply expanded as the vast oil fields of the area were discovered and opened for production. This expansion gave birth to the vital need for machines and craftsmen to manufacture refinery equipment for processing the new-found oil. It was this condition in 1936 which channeled Western's facilities toward the manufacture of heat transfer equipment.

Today, Western is counted as one of the primary manufacturers of all types of heat exchangers. The big Western "W" can be seen in the largest plants of the Petroleum, Chemical and Petro-Chemical industries — ample testimony to Western's ability to keep pace with these rapidly expanding fields.

An advertising series titled, "The Brand of Progress" will present the reasons behind the growth of Western Supply Company. Follow this series in this magazine.

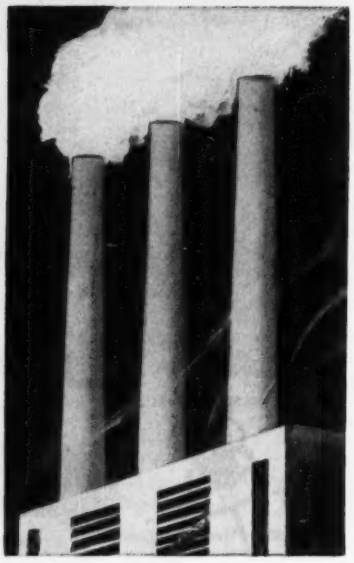
WESTERN *HEAT EXCHANGERS*

WESTERN SUPPLY CO.

P. O. BOX 1888 • TULSA, OKLAHOMA

AIR POLLUTION

How high should a smoke stack be?



From decades of experimentation general rules have been formulated to establish the behaviour of smoke wastes from chimneys. Behind it all is the meteorological knowledge of time, temperature, humidity and turbulence that can be established for your plant location.

If you have an air pollution problem in your manufacturing process . . .

Before you build or buy that new plant . . . before you modify your present equipment . . .

Better get the latest meteorological facts about your present or future location.

They can save you a lot of money.

Did you know that even the location of your chimney can help control air pollution? Put it at the wrong end of the building . . . and you've got trouble.

Can you process at night under more favorable conditions? Can you make better use of wind speed and direction to control air pollution?

Foresighted Company Officials

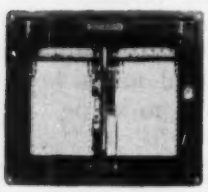
Management, making full use of meteorological conditions above a plant site, can anticipate exactly what will happen to smoke from a stack before a blue print is drawn . . . or a steam shovel digs out the first foundation.

Bendix-Friez . . . the standard of the world for meteorological instruments for 77 years offers you all its facilities to help you find a practical, economical approach to your air pollution problems . . . now or before they start.

Write to the address below. An inquiry involves no obligation at all.

AEROVANE indicates and records windspeed and direction. Recognized as "best all-purpose wind measuring instrument yet devised." Readily installed and easily maintained.

WIND SPEED AND DIRECTION both indicated on the same Bendix-Friez dial. Indirectly, illuminated. Wind velocities up to 100 miles per hour.



AEROVANE RECORDER Twelve different chart speeds. A single chart provides a record for two weeks when operated at the normal rate of 3 inches per hour. Aerovane indicators are all controlled by a single Aerovane transmitter.

HYGRO-THERMOGRAPH The leader in its field. Noted for precise accuracy and long-time dependability. Portable, easy to operate. Widely used in laboratories, factories and offices.

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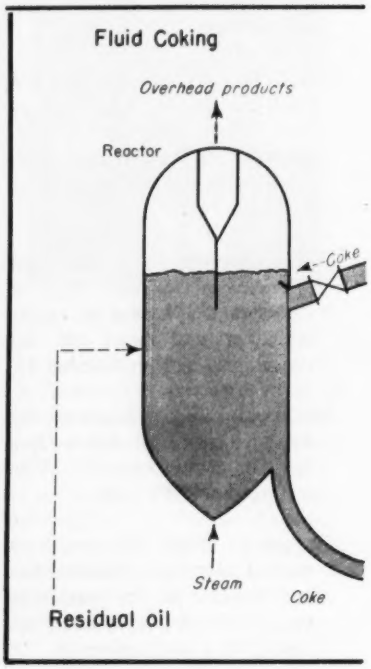
FRIEZ INSTRUMENT Division of Bendix AVIATION CORPORATION
1418 TAYLOR AVE., BALTIMORE 4, MD.

EXPORT SALES: Bendix International Division
205 E. 42nd St., New York 17, N. Y., U.S.A.

THIS MONTH'S

Letters:



Coking Goes Continuous

Sir:

The story on p. 126 in your October "What's Happening" department is an interesting one on recent developments in coking processes.

Standard Oil Development's process (see diagram) certainly illustrates chemical engineering ingenuity in adapting the fluidized-solids technique to coking. As I see it, it will become a major trend in offering petroleum refiners a better way for upgrading residual fuel stocks. . . .

A. M. REYNOLDS
Petroleum Engineer
Marcus Hook, Pa.

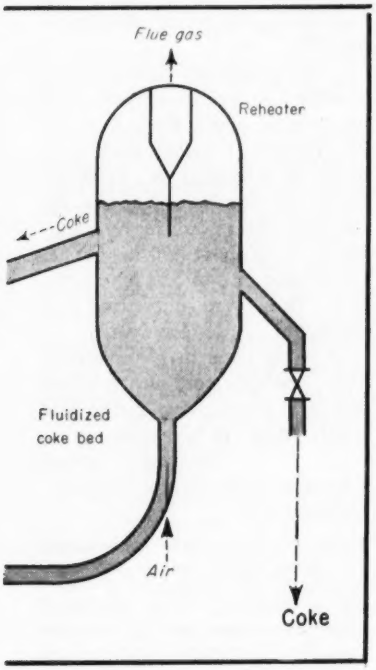
▶ *Yes, we agree that coking will continue to grow in importance since it permits residuals to be upgraded into gasoline and heating oils. Our October story also described the Lummus semi-commercial contact process.*—ED.

Pro: Refresher For 30 Plus

Sir:

I very much enjoyed your September article on Thermodynamic

Pro & Con



Principles in the new "Refresher Course" series.

Your proposed articles on physical equilibria, separation processes (distillation, extraction, etc.) and vapor-gas phenomena (drying, condensing, humidification) would, I am sure, fill a long-felt need of those persons in the 30-40 age group of chemical engineers. . . .

RICHARD B. MACMILLAN

Research Dept.
Alkali Division
Imperial Chemical Industries, Ltd.
Norwich, England

▶ *For the benefit of Reader Macmillan and others who have asked the same question, the refresher articles on physical equilibria, separation processes and vapor-gas phenomena are no longer "proposed." We have made definite plans to go ahead and publish the complete series. You can expect refresher articles on the above subjects during 1954 and 1955.*—ED.

Nitric Plants Today

Sir:

It was with considerable interest that I read your article entitled "Nitric Acid Plants Today" in

LECITE · EL CHEM *Two important names to remember when you plan chemical construction!*

LECITE — a synthetic resin cement, combines the most desirable properties of the phenolics — and eliminates their disadvantages.

Alkali-proof, as well as acid-proof, LECITE has a wide diversity of applications. It serves as

- Bonding agent
- Impervious liner, when reinforced with glass cloth or metal mesh
- Mortar for corrosion-proof brick lining
- Impervious membrane between brick or tile floor and concrete sub-base

LECITE is *inert to all acids,* except a few strongly oxidizing chemicals, and to all alkalis of all concentrations; also to most organic solvents and to oils and greases.

LECITE *has a tensile strength of 1,000 psi.,* adheres to brick and other ceramic surfaces with a bond of over 700 psi.; and it withstands temperatures up to 370° F.

LECITE *may be stored indefinitely;* has longer working time without sacrifice of final setting speed; will set under damp conditions and at temperatures as low as 45° F.; is available in compositions having high or low electrical restivity and it has high impact resistance.

LECITE is widely used in the equipment of plants producing organic chemicals, phenol, alcohol, nylon, copper sulphate, acids, textiles, steel, soft drinks, soaps, food and dairy products. It serves in reactors, filters, towers, alkylators, neutralizing tanks, stacks and fume ducts.

Nutsch Filters — Used to filter hot mixtures of sulphuric acid and organic materials. Welded steel construction, lined with DURO-BOND rubber, protected with acid-proof brick lining, joined with LECITE. Norton filter plates supported on acid-proof piers, seen in foreground.

LECITE is one of EL CHEM's new corrosion-proof construction materials. Other EL CHEM materials include:

BRIMSO and Carbon-BRIMSTO — plasticized sulphur-base cement. Quick-setting. Withstand all inorganic acids (except strongly oxidizing) and mild alkalis, at temperatures to 200° F.

DURO-BOND — Seamless natural rubber lining. Compounded to meet specific requirements of unit.

DURO-XXX — Silicate, quick-setting cement. Impervious to all mineral acids except hydrofluoric.

DURO-SAN — Saran rubber lining. Applied in sheet form. Resists solvents and oxidizing acids. Withstands constant temperatures to 150° F. — and higher when protected by brick lining.

SYNTHO — Phenolic cement. Inert to all acids except highly oxidizing ones.

DURO-PRENE — Seamless Neoprene synthetic rubber lining. Vulcanizes at room temperature.

EL CHEM offers an all-inclusive service: materials, design — and construction by our own crews — every man a specialized worker in this specialized field. This means responsibility centered on a single source, no alibis, speedier installation, units into production usually much more quickly. Supervision by EL CHEM engineers offered if you prefer your own contractors.

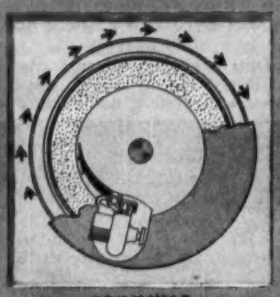
EL CHEM engineers with more than forty years experience in acid-proof construction for chemical, steel, food, and textile industries, are ready to study your corrosion-proofing problem, make recommendations and prepare plans and estimates, without obligation. Write for technical bulletin.

Electro CHEMical
ENGINEERING & MFG. CO.
754-A Broad Street • Emmaus, Pa.
Manufacturers of acid- and alkali-proof cements, linings and coatings since 1912

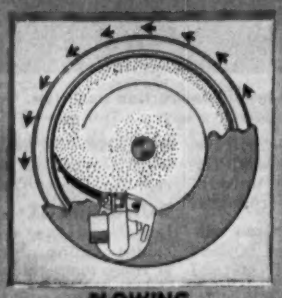
safe CENTRIFUGALS

Keep plant accidents at a minimum and maintain constant production with the safest centrifugal in the chemical industry today.

The Roberts G-8 Automatic Electric Drive Centrifugal features many unique developements which until now have been wanted, but not achieved.



SPINNING



PLOWING

REVERSE PLOWING—Completely eliminates the hazard of accidental plowing during the spinning operation. (See illustration.)

OVERLOAD PROTECTION—Loading gate closes automatically when basket has received predetermined charge.

TEMPERATURE—High speed connections are further protected by thermal overload device built into the motor.

CURBING—Completely enclosed.

UNBALANCED LOAD PROTECTION—Gyration Switch protects machine against possible damage caused by unbalanced load.

REGENERATIVE & MECHANICAL BRAKING—Quick, safe stops are achieved with the G-8 braking system.

These are just a few of the many new features which THE WESTERN STATES MACHINE COMPANY has developed and incorporated into its machines. For additional FREE information on Roberts Centrifugals write The Western States Machine Company, Hamilton, Ohio.

ROBERTS SIEVERS

The WESTERN STATES MACHINE COMPANY

HAMILTON, OHIO, U. S. A.

your November 1953 issue (p. 150).

Having spent almost 20 years in or close to the design, operation and supervision of nitric acid, nitrate and ammonia plants, I was impressed with the job you did of highlighting the recent advances in the field.

I was particularly interested in how the Commercial Solvents plant has reduced power needs by some 30 percent. I gather that engineers at Chemical & Industrial Corp. are largely responsible for reducing power needs for compressing air from about 475 hp.-hr. per ton of acid . . . to 320 hp.-hr. per ton. This is an interesting and significant . . . development.

It is my hope that you will be able to publish more such excellent and terse roundups as "Nitric Acid Plants Today" in November.

SEWARD C. BOWEN
Chemical & Mechanical Engineer
Newark, N. J.

▶ *Our news featurette on modern nitric acid plant design features was made possible by the cooperation of Chemical & Industrial Corp., Cincinnati. This firm designed and built the new units for Commercial Solvents Corp. at Sterlington, La., which were described in our roundup story.*—ED.

Pro: Pollution Control

Sir:

Your feature articles in the October and November issues of *Chemical Engineering* entitled (1) Entrainment Separation and (2) Dust Collectors are very interesting and valuable.

We hope that in future issues of *Chemical Engineering* more feature articles will appear on air pollution control equipment or on air pollution control in general. There is a great need in industry for information such as in your articles.

We have called your article to the attention of many industries in this county who in the past have sought this type of information from our department. In publishing this type of article you are not only directly helping industry but also helping to prevent or correct air pollution—a matter that now concerns the general public.

WM. P. TOWNES
Air Pollution Engineer
County of Santa Clara
San Jose, Calif.

▶ We hope—and intend—to continue publishing feature articles such as Reader Townes mentions. We invite our readers to send in their own article ideas and suggestions.—Ed.

Shortage of Engineers?

Sir:

I have just noted the elegant brochure put out by *Chemical Engineering* and *Chemical Week*, entitled "Wanted Men."

I am somewhat concerned about this type of information because I doubt whether there is a real shortage of chemical engineers. So far as I can see, a shortage of chemical engineers is not holding back either the chemical or the petroleum industries. In fact, a great many of the engineering graduates are being used by industry in ways that waste their engineering training. Further, I can see no indication that industry considers engineers to be "precious commodities."

While starting salaries for engineers have increased in the last fifteen years, there is no evidence that they have increased any more percentagewise than hourly rates of union labor. The salaries of men who have been out of school for a period of years have not increased even in this proportion.

Another factor that makes me question the serious shortage statement is the fact that I know of at least two instances within the last few years in which companies have released a considerable number of experienced engineers and these men have not found it too easy to find new positions.

In my opinion what should be emphasized is improved quality and not increased quantities of chemical engineers. As you may know, the chemical engineering classes for the last couple of years have shown an increase.

In fact, at M.I.T. it looks like the class that will be graduating in 1956 will have at least 50 percent more chemical engineers than the classes of the last few years. I have some concern as to whether there are going to be jobs available for this increased output.

E. R. Gilliland
Department of Chemical Engineering
Massachusetts Institute of Technology
Cambridge, Mass.

1 Chemically inert
—will handle all corrosive liquids, petroleum products, gases and solvents.

2 Life-long flexibility
—will not damage or fatigue under severe vibration or repeated expansion and contraction.

3 Outstanding electrochemical properties
—eliminate electrolysis in the handling of chemicals, acids, etc.

4 Wide temperature range
—flex perfectly and otherwise physically unaffected over a wide temperature range.

"John Crane" Bellows offer the Chemical Industry a positive answer in the transmission of "hard-to-handle" liquids and gases. Applications include vibration dampeners, expansion joints and connectors for misaligned couplings.

Made from a special densely molded stock and so machined that there is no inherent stress at their free length—*they expand and contract in either direction with equal freedom of motion.* End flanges of French-type gasket construction facilitate easy assembly and assure a leak-proof seal. Stock sizes are available in a full range of standard pipe dimensions from 1 to 8 in.

Bellows are also available in a wide range of designs suitable for metering pumps, pressure accumulators, batching scale connectors, etc.

Further information on Teflon parts and products, including bellows connectors, pump and valve packings, tubing and other molded forms, is available in "John Crane's" 12-page illustrated catalog, The Best in Teflon. *Send now for your free copy. Crane Packing Company, 1809 Belle Plaine Avenue, Chicago 13, Illinois.*

JOHN CRANE CRANE PACKING COMPANY

*DuPont Trademark for tetrafluoroethylene resin.

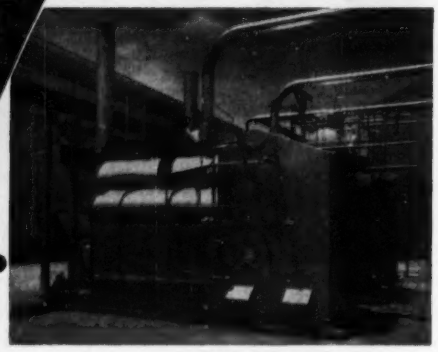
Move in STEAM to order

ERIE CITY KEYSTONE STEAM GENERATOR

Need

2,490
3,320
4,980
6,640
8,290
9,950
11,610
13,290
14,940
16,620
19,930
23,220
26,550
33,200

Pounds of steam Per hour?



2— E. C. 150 hp. Keystones installed outdoors at Corpus Christi, Texas plant of Reynolds Metals Co.

Keystone Steam Generators are backed by Erie City Iron Works with over 112 years in steam generation. These are factory assembled 2-drum water tube boilers heavily insulated and steel cased. They may be fired by gas or oil or combination burners. They are completely equipped with all safety and automatic controls.

Select a Keystone from 75 thru 1000 hp. and answer a need for immediate steam. They can be located where you need the steam. Keystones are automatic and require little attention. Write for revised Catalog SB38CE-7.

ERIE CITY IRON WORKS • Erie, Pa.

Every Keystone is test block fired before shipment with the burner and fuel selected.

ERIE CITY KEYSTONE STEAM GENERATOR

14 STANDARD SIZES 75 THRU 1000 HP.

You can depend on ERIE CITY for sound engineering

PRO AND CON, cont. . .

► *We're glad to pass along these views of a leader in the field of chemical engineering education on the "engineering shortage" debate. So far, the "yea's and nay's" we've received on this somewhat touchy subject just about balance each other. We do agree, though, that more emphasis should be put on quality rather than on mere quantity.*—ED.

Pro: More Bouquets

Sir:

For some peculiar reason that's associated with the average mind, I suppose, your readers probably don't write with any reasonable degree of frequency, except when they object to some phase of your editorial policy.

It's not my usual custom to write when I find errors or when I am pleased.

But the recent issues of *Chemical Engineering* have made so pronounced an impression upon me that I have been stirred up out of my past inclinations and have been prompted to tell you that I think *Chemical Engineering* is rapidly becoming precisely the magazine that I seek in the chemical engineering field.

JOHN V. GRIMALDI
Assistant Manager
Accident Prevention Dept.
Association of Casualty & Surety Companies
New York, N. Y.

► *We appreciate these kinds words on the job we're trying to do. Bouquets as well as brickbats help keep us on our editorial toes.*—ED.

Enthalpy Correction Corrections

Sir:

In your recent article "Chemical Engineering Fundamentals" there is a discussion on the calculation of enthalpy of gases under high pressure. The discussion does not go far enough.

After calculating the convection factor, Hougen & Watson (Chemical Process Principles, Vol. II, p. 494) recommended the multiplication of this convection by the factor θ for any temperature above the critical. You can calculate θ from the equation:

$$\theta = \left(\frac{T_c}{470}\right)^4$$

where T_c is the critical temperature

in degrees Kelvin and n is a function of the reduced temperature T_r.

T_r	n
1.0	0.37
1.05	0.28
1.1	0.25
1.2	0.20
1.3	0.18
1.4	0.16
1.5	0.15
1.6	0.14

Hougen & Watson did not give 0 for temperatures below the critical. They also point out that in many cases the correction is small and the charts alone are satisfactory.

THOMAS CIARLARIELLO
Chemical Engineer
Charleston, W. Va.

► *For Author Corrigan's answer to the point brought up by Reader Ciarlariello, see the letter that follows.*—ED.

Sir:

Mr. Ciarlariello is absolutely right in pointing out the further correction that may be used and which appears in Hougen & Watson's Vol. II.

I am familiar with this added factor and, in fact, I used to present it in my course at West Virginia University. However, upon calculating several cases I noticed that this second correction was in many cases less than the variation due to inaccuracy in reading the chart. I decided to omit it.

THOMAS E. CORRIGAN
Chemical Engineer
Mathieson Chemical Corp
Grand Island, N. Y.

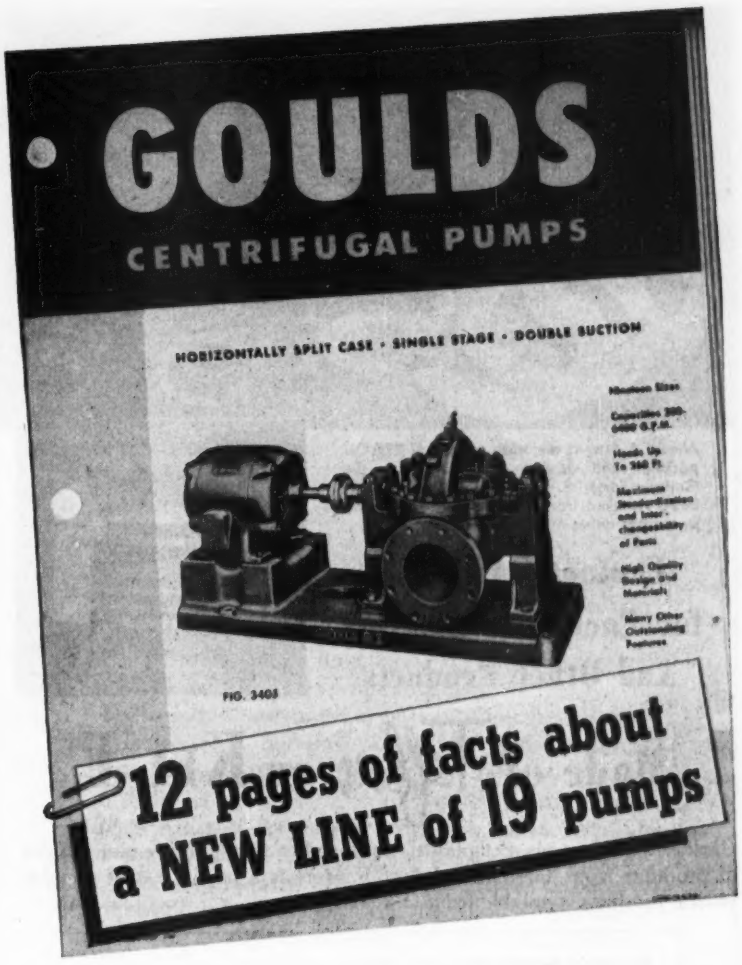
Chemists' Club Library

Sir:

This is a request for your continued support of The Chemists' Club Library.

You can't have a faultless memory—but you have to know what you want when you need it—that is what the Chemists' Club Library does for you. President W. F. George of the Club recently sent out a letter that tells the story of the Library. We enclose a copy of this letter.

More than 50,000 volumes, experienced librarians, and copious indexes are ready to answer your questions from aureomycin to zirconium, from gamma globulin to


GOULDS
CENTRIFUGAL PUMPS
HORIZONTALLY SPLIT CASE • SINGLE STAGE • DOUBLE SUCTION
FIG. 3405
12 pages of facts about
a NEW LINE of 19 pumps

The quickest way you can really discover what the new Goulds Fig. 3405 centrifugal pump can do for you is to read the descriptive bulletin pictured above.

Here are some hints of what you'll find:

The quality of materials and extras of design that you have been able to get only by paying extra are *standard* on this new pump: stuffing box bushings, stainless steel impeller keys, Teflon water seal rings —to mention a few.

The Fig. 3405 carries interchangeability of parts far beyond anything we've been able to do before. Only three shaft and rotating parts assemblies (exclusive of impellers and wearing rings) provide for 19 pump sizes.

This means real spare parts inventory savings for any plant that uses many pumps. It also means easy-to-make field changes to meet new requirements.

We've come as close as modern design and materials allow to putting into this new pump what our industrial customers have told us they want. The 12-page illustrated bulletin tells you all about it. We'll be glad to send you a copy.

To get a copy of Bulletin 721.6, get in touch with the nearest Goulds representative or just fill in the coupon, pin it to your letterhead and mail it to us at your convenience.

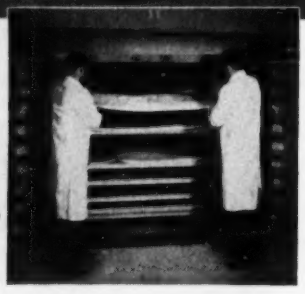
Goulds PUMPS INC. Seneca Falls New York

GOULDS PUMPS, INC.
Dept. CE, Seneca Falls, N. Y.

Please send me 12-page information Bulletin No. 721.6 on the new Fig. 3405 centrifugal pump.

Name_____
Company_____
Street_____
City_____ Zone____ State_____

Above: A few of the wide variety of TEFLON packings and gaskets manufactured in the Garlock factories. *Right:* Sheets of TEFLON being removed from a special electric sintering oven after curing at 700°F.



Contact GARLOCK for Packing, Gasketing-- And Other Products

Made of Teflon# or KEL-F†

Garlock's modern plastics plant is equipped to manufacture many types of products from TEFLON and KEL-F. Here is a partial list of popular plastic products available from Garlock.

	KEL-F	TEFLON
PACKINGS for valve stems, rods, shafts		
CHEVRON* packing, "O" rings, V rings	X	X
Braided ribbon or braided yarn (a new closely woven braid)		X
Asbestos with TEFLON impregnation		X
Mechanical seals with TEFLON sealing components		X
GASKETS AND SHEET PACKINGS		
Ring gaskets or envelope type with fillers	X	X
Slip-on gaskets for glass pipe		X
Spiral wound metal gaskets		X
Large sheets (KEL-F 48" dia.-TEFLON 48" square)	X	X
DIAPHRAGMS—DISCS—RODS—SLEEVES	X	X
TAPE—electrical and general purpose grades		X
MOLDED AND MACHINED PARTS for various purposes	X	X
FILLED COMPOUNDS: calcium fluoride, copper and others		X

For any product made of KEL-F or TEFLON, contact our sales office nearest you or write us direct.

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Sales Offices and Warehouses: Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland Denver • Detroit • Houston • Los Angeles • New Orleans • New York City • Palmyra (N.Y.) • Philadelphia Pittsburgh • Portland (Ore.) • Salt Lake City • San Francisco • St. Louis • Seattle • Spokane • Tulsa.

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†The Kellogg Company's Trademark

GARLOCK PACKINGS, GASKETS, OIL SEALS MECHANICAL SEALS RUBBER EXPANSION JOINTS

PRO AND CON, *cont. . .*

hydrazine. French, German, Japanese, Russian—the world's chemical information on hand for you.

But to help you, we need your help. The Club provides the space and a large part of the expense of running the Library, but in this day of rising costs, we cannot give our industry the service it needs without financial help from the industry.

Please send your contribution to the Library of The Chemists' Club.

DONALD PRICE

Chairman,
Library Committee
The Chemists' Club
New York, N. Y.

► *We received this letter (and contributed several dozen books) but thought that you, too, might wish to give your support to one of the best chemical libraries in New York.*—ED.

Pro & Con: Big and Little

Sir:

Please accept my commendations and congratulations on Mr. Richard V. Reeves' article "Better Off Working for a Small Company—or a Big One?"

I have studied this matter for better than 40 years and I believe Mr. Reeves has succeeded in impartially summarizing the principal advantages and disadvantages.

Two matters, however, should be borne in mind and those Mr. Reeves has, I am afraid, failed to emphasize. The natural characteristics of the individual required for success in the large company are quite different from those in the small company. The motivation or drive as well as aptitudes are different. The most unhappy man in a large company is one whose characteristics would make him the most happy in a small company or vice versa.

Just what these characteristics are I have dealt with in many of my previous papers and addresses so won't bother you with them now.

The second matter that Mr. Reeves might have mentioned is the fact that

We welcome short, pertinent letters from our readers giving their opinions on developments in the chemical engineering profession and in the chemical process industries. Address the Editor, Chemical Engineering, 330 West 42nd Street, New York 36, N. Y.

his sample is taken while we are living in an abnormal or war-type economy. Since the government buys in huge amounts, naturally the larger company gets the most material benefit. Under normal peacetime conditions, however, there is quite a reversal and I believe you will find that the smaller company has somewhat the better of the situation even though Mr. Reeves' article indicates that at present the larger company is somewhat the better.

CROSBY FIELD

Engineer

Brooklyn 2, N. Y.

▶ *We're glad to pass along these additional interesting angles on the subject of the big versus the little company. Editor Reeves' article in September (p. 197) has pulled a flock of letters and voluminous comment —acid and otherwise.*—ED.

LITTLE BONER

Cold Night, Hot Reactor

It was 2:30 in the morning when the department foreman's telephone rang. Too sleepy to swear, he crawled out of bed to answer it.

"Something's gone wrong in Reactor 4," one of his night operators yelled. "I can't get the temperature below 80 deg. no matter what I do, and I know it's not supposed to go over 35 deg. Think the damn thing'll explode?

The foreman threw on his clothes and dashed to the plant through the December storm to find out what was wrong.

He knew that an industrial type thermometer with a 0-100 deg. range was used and that to get an accurate reading it had been placed upside-down near the agitator. But why should the reaction temperature go to 80 deg. and refuse to drop?

After half an hour he finally caught on to what had happened: The bulb had broken and mercury had fallen to the 80-deg. mark. It was the only reading possible.

"Even though the night was cold as Siberia, it took me an awfully long time to cool off," the foreman writes. If you've had to cope with a "little boner" like this, why not tell it to the Editor, *Chemical Engineering*, 330 West 42nd St., New York 36, N. Y. We keep all names confidential.

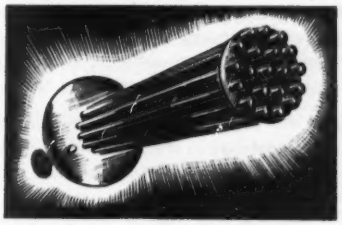
Nothing is "just as good as" TANTALUM Nothing can be substituted for it

Don't compare Tantalum, *analyze* it! A study of its excellent properties—immunity to corrosion—high thermal efficiency, high tensile strength, ductility, puts Tantalum in a class by itself. No other material comprises all its advantages.

These *inherent* advantages of Tantalum have introduced new economy and efficiency to many chemical processing operations. An excellent heat conductor, Tantalum saves steam or cooling water, permits closer process controls. As a metal with high tensile strength and easy ductility, Tantalum allows light gauge construction; eliminates breakage as well as expensive framework and supports. And because Tantalum is acid-proof, it eliminates many of the costs of corrosion such as product contamination, equipment repair and replacement, shutdowns, etc.

These economies and others are possible with Tantalum. Call in an experienced Fansteel engineer to tell you, quickly, whether or not they can be effected in your processing operations.

Use Tantalum with economy for most acid solutions and corrosive gases or vapors except HF, alkalis, or substances containing free SO_3.



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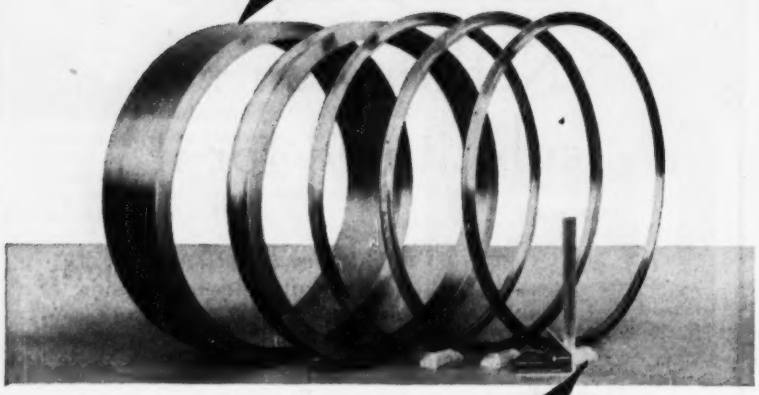

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WHAT'S HAPPENING

(*Continued from page 132*)

White and Merker Honored By University of Michigan

Two pioneers of chemical engineering were among the 10 recipients of honorary degrees at the University of Michigan, Ann Arbor, during the recent celebration of the Centennial of Engineering. They were the late Alfred Holmes White, professor emeritus of chemical engineering at the University of Michigan, and Harvey Milton Merker, director of scientific relations for Parke, Davis & Co. of Detroit.

Professor White's degree was awarded posthumously. He died August 25, 1953. He had been chairman of the Award Committee for the Chemical Engineering Achievement Award, sponsored by *Chemical Engineering*. A pioneer educator in chemical engineering, White helped to organize the department of chemical engineering at the University of Michigan, the second of its kind in the United States, and watched it grow through the 28 years of his chairmanship to a place of leadership in this country. Many of the students whom he trained and inspired attained important posts in education, industry and the professional societies.

Active in research, author of texts and technical articles, onetime president of the American Institute of Chemical Engineers and the American Society for Engineering Education, White was the inventor of chemical processes useful to industry and during wartime was a valued member of the technical branch of the armed forces. White was cited for his unique position in the esteem and affection of hundreds of colleagues and former students throughout the world. The posthumous award was bestowed on him in recognition of his distinguished service to science, to education and to his fellow man.

Merker, a chemical engineering graduate of the University of Michigan in its class of 1909, now directs scientific relations for Parke, Davis & Co. of Detroit. As a scientist, he has devised ways of producing substances valuable in combating disease.

As an engineer, he has modified and improved methods of pharmaceutical manufacture. He has participated in civic enterprises and provided leadership in these undertakings. He has helped the University of Michigan to achieve many of its goals, and was cited for his distinguished career.

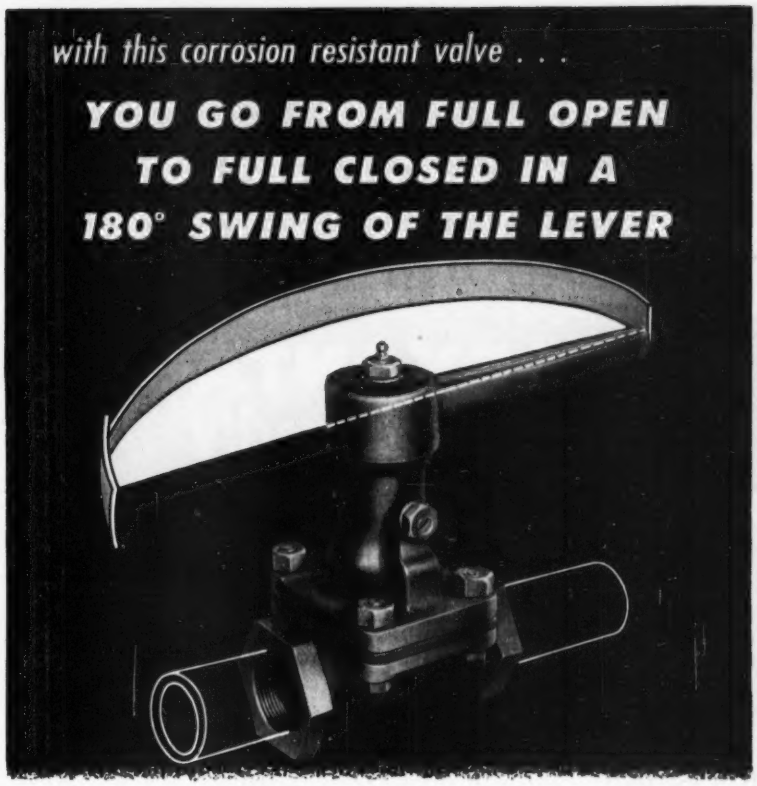
Awarding of the degrees of Doctor of Engineering by President Harlan Hatcher of the university followed an address by Secretary of Defense Charles E. Wilson on "The Continuing Frontier." Wilson was one of the degree recipients.

Those receiving degrees, in the order of presentation, were: Wyeth Allen, president of Globe-Union, Inc., of Milwaukee; Harold Franklin Robinson, chief naval architect of the Shipbuilding Division of the Bethlehem Steel Co., Boston; Smith J. DeFrance, director of the Ames Aeronautical Laboratory at Moffett Field, California; Thomas Daniel Jolly, vice president, chief engineer and director of purchases of the Aluminum Co. of America, Pittsburgh; Lou Revere Crandall, president of the George A. Fuller Co., New York; Harvey Milton Merker, director of scientific relations for Parke, Davis & Co., Detroit; James Wentworth Parker, former president and general manager of the Detroit Edison Co., Detroit; Robert Moses, commissioner of parks, New York; Charles Erwin Wilson, Secretary of Defense, Washington, D. C.; and Alfred Holmes White, formerly professor emeritus of chemical engineering at the University of Michigan, Ann Arbor, who received the only posthumous degree.

Cominco's Plant Boosts Ammonium Phosphate Output

In Canada the new $9 million chemical fertilizer plant of Consolidated Mining & Smelting Co. has gone into production at Kimberley in British Columbia. The plant, part of Cominco's $56 million expansion, is designed to produce 190 tons daily of ammonium phosphate.

Most of the output will go to Canada's prairie provinces. Construction took two years. Raw materials used in production are phosphate rock from Montana, ammonia from Alberta and iron sulfide isolated during the processing of lead-zinc ore at the nearby Sullivan concentrator. The iron sulfide is treated in a roaster



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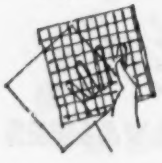

#2. Some wire cloth producers can work in only a certain few metals or in a limited range of mesh sizes. Here at Cambridge we can weave cloth from any metal that can be drawn into wire...our range of sizes runs from 20 x 250 mesh up to 4 inch openings ...a BIG advantage for customers with varied needs.

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plant and the sulfur dioxide generated is used to produce sulfuric acid.

For 20 years Cominco has operated a chemical fertilizer plant at Trail, B. C., and the planning for the new Kimberley plant was handled by Cominco engineers. Directing the construction project was L. J. Nicholson, with a staff of 150 workers.

Refineries Expanding In Vancouver Area

Boosting production from 12,000 to 22,500 bbl. daily, a new $13.5 million refinery of Imperial Oil Co. Ltd. has gone on stream at Ioca, near Vancouver, British Columbia.

The new refinery, largest at present in the Pacific Northwest and the first in British Columbia to have a fluid catalytic cracking unit, is the result of an 18-month reconstruction job on Imperial's old plant. This original plant of Imperial was built at Ioca, on the north shore of Burrard Inlet, in 1915, with an initial capacity of 1,000 bbl. daily, which was later expanded

Standard Oil Co. of British Columbia and Shell Oil Co. are both building new $10 million refineries in the Vancouver area, with openings slated for next year. The refineries will use Albert oil from Trans Mountain pipeline when deliveries begin in the near future.

Kraft Mill Steps Up Output As Research Intensifies

Production at the $40 million kraft pulp mill of MacMillan & Bloedel Ltd. at Harmac, near Nanaimo on Vancouver Island, has been more than doubled with the running in of a second section of the mill.

Output will now be 600 tons per day. The plant started operation in 1950 with a capacity of 250 tons of bleached pulp daily. The expansion since then has cost $20 million.

Meantime, MacMillan & Bloedel is stepping up its research. Dr. John H. Fisher, a specialist in chemical pulping problems from the University of British Columbia, has been appointed director of research. Dr. Earl Hallonquist has been appointed assistant director. Both will work under the direction of Vice President Clifford Crispin of the company's pulp division.

Present research staff and facilities

at the company's pulp mills at Port Alberni and Harmac, and at the Vancouver plywood plant will be consolidated and set up in a new building to be built at Harmac. Research on both pulping problems and plywood manufacture will be intensified.

Du Pont Shutting Down Lithopone Production

Manufacture and sale of lithopone pigments will be discontinued by the Du Pont Co. at the end of next February. Production will gradually taper off and cease before the end of December as raw materials on hand are consumed. Sales will continue from reserves until February 28.

Du Pont's decision came because demand for lithopone has been declining for several years and the nation's production capacity for it is considerably greater than needed.

Lithopone has been largely superseded by titanium dioxide an exceptionally white pigment, for most paints and other uses. Titanium dioxide is manufactured by Du Pont at its Edge Moor, Del., and Baltimore, Md., plants, as well as by other companies.

Other producers are manufacturing grades of lithopone that can be substituted for all of Du Pont's lines except its Ponolith NR-8 lithopone. To enable consumers to get this grade in the future, Du Pont has offered to furnish, at no cost, other producers with the technical information required to make it.

The decision to shut down lithopone production will enable Du Pont to divert plant and personnel to other products more in demand. Lithopone has been produced at the Newport, Del., plant, which now has a large expansion of titanium metal production facilities under construction.

New Polyethylene Producer Picks Texas City as Site

Texas City has been picked as the site for the first polyethylene production plant of Monsanto Chemical Co. Construction is now under way, and the plant is expected to start turning out polyethylene in the fourth quarter of 1954. Initial capacity will be about 66 million pounds, with a 50 percent increase in capacity slated for 1957.

"Texas City was chosen as the plant site," says Robert K. Mueller, general manager of Monsanto's plastics operations, "after careful consideration of

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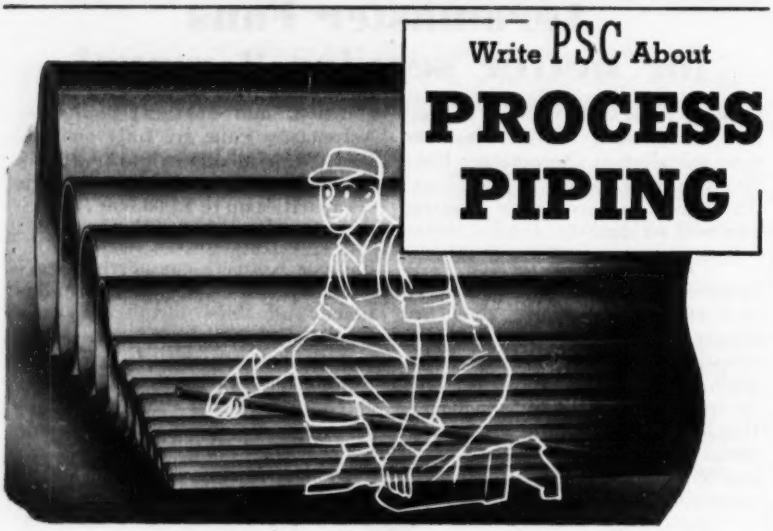

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16 other possible locations. Monsanto believes it has settled on the most logical location for initial operation."

Monsanto already produces styrene, vinyl chloride and acrylonitrile at Texas City, and will supply the new plant with ethylene, its principal raw material.

The new Texas City polyethylene plant will be the third plastics plant operated by Monsanto in the United States. Others are at Springfield, Mass., and Port Plastics, Ohio. Addition of polyethylene to its plastic products will make Monsanto the first to produce all six of the major plastics. These include styrene, phenolics, cellulosics, vinyls, aminoplasts and polyethylene.

Government to Lease Muscle Shoals Plant

The government will lease its chlorine plant at Muscle Shoals, Ala., built by Monsanto Chemical Co. under the supervision of the Army's Corps of Engineers.

Since completion of a 30-day test run completed in July 1952 the plant has been on a standby basis. It is one of the largest chlorine plants in the nation.

It was designed to produce 225 tons of chlorine and 250 tons of 50 to 70 percent caustic solution daily. Original purpose was to supply the government with chlorine, then in short supply, and to produce additional amounts for commercial use.

The government, in the lease, will reserve the right to a stipulated amount of chlorine and caustic for operation of a nearby government facility. The government will also reserve the right to purchase the plant's output for other Defense Department agencies.

New $75 Million Refinery For Shell in Northwest

A new $75 million refinery, with a 50,000-bbl. capacity, will be built for Shell Oil. at Anacortes, Wash., by the Bechtel Corp. of San Francisco.

Construction will start in mid-1954. At its peak the construction force will number about 1,500, the Bechtel Corp. estimates. Much of the equipment, except specialized units, will be purchased in the Northwest.

Major refining units will consist of

a crude oil fractionating unit, a platformer and a catalytic cracker. The crude unit and platformer will be completed by the middle of 1955, and the other units, including the cat cracker, by the end of 1955.

The first units, however, will be put into operation before the entire refinery is completed. It is expected the first products will begin to come off the line about mid-1955.

New Enterprise Plans Mexico Sulfur Plant

Crude sulfur will be extracted by the autoclave process in a new plant that Texas International Sulphur Co. will erect in Mexico. The plant, near San Felipe, Baja California, will process sulfur from Texas International's Navarro concessions and from adjoining concessions where mining rights have been newly acquired.

Design of the plant is under the direction of J. Harry Pollard of Houston, Tex., consulting engineer for the company, who will supervise the plant's construction and operation.

Sulfur deposits have been known to exist in the San Felipe area, 125 mi. south of the border, for approximately 40 years, but heretofore no practical processing and marketing facilities have been established. New transportation facilities, together with the new processing plant, have now made the deposits of commercial value.

Considerable time was spent by Texas International Sulphur Co. in both engineering and geological studies before the decision was made to erect the plant. Dr. Eugene Callaghan, director of the New Mexico Mining & Technical Institute, made the most complete geological survey ever undertaken in the area.

"Our company estimates that it can produce commercial grade sulfur at San Felipe and sell it profitably in northern Mexico and in the world export market," says President Victor Dykes. "Our price should be easily competitive with Gulf Coast sulfur plus freight in the West Coast area."

Pollard points out that ore bodies are of considerable size and that numerous pits and cuts have already been opened up and that further exploration will continue. Pockets of high sulfur content occur frequently in the ore bodies in these surface deposits, which show themselves in an area of several miles.

Texas International Sulfur Co. was

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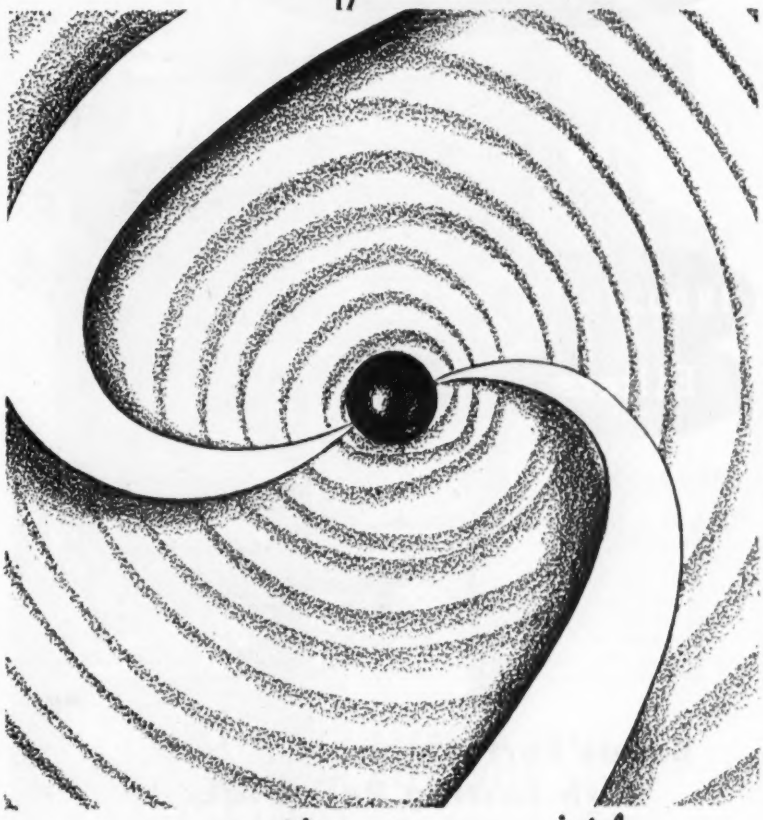

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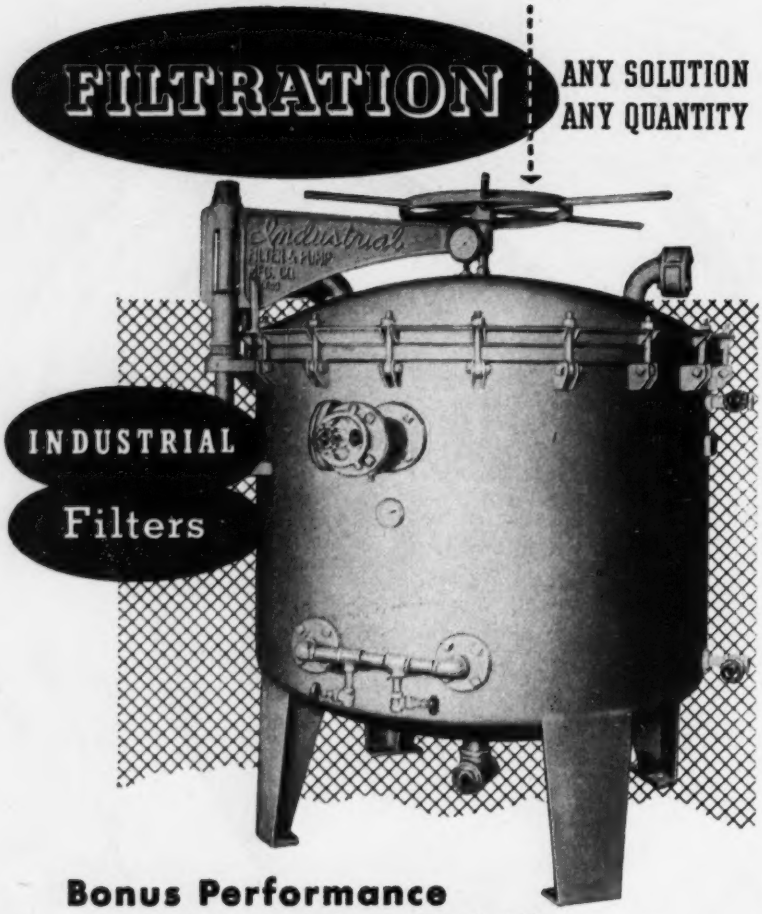

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organized in February 1953 by Tom Kramer and M.A.S. Makris of Houston, together with Mexican associates. Dykes, formerly vice president of Texas Fund, Inc., became president in June.

The company issued 400,000 shares of common stock to the public in August 1953 after it acquired its Mexican mining concessions. The full issue at $1 per share was subscribed in a few hours and the market price has advanced more than 50 percent during recent weeks.

Europe Lags Behind U. S. In Instrumentation

"The instrument industry in Europe is 10 years behind the United States," Porter Hart, superintendent of instrumentation at the Dow Chemical Co., Freeport, Tex., told an engineering institute at the University of Wisconsin in Madison, Wis., recently.

Automation in the chemical industry was explored by the institute, which is sponsored jointly by the University of Wisconsin's Extension Division and the College of Engineering.

Hart recently toured Europe for the Instrument Society of America, of which he is president.

Europe, he said, "doesn't show any signs of catching up" in the instrument industry. "The same is true of the use of process control instruments in European chemical works," he added.

European instrument makers retain a traditional pride of craftsmanship, he said.

"A man will work for hours," Hart pointed out, "putting a high polish on a part that everyone knows will lose its polish in a single day after installation. The instrument would be every bit as good without the gleaming finish, but he just won't have it any other way."

John T. Diebold, management consultant of Weehawken, N. J., told participants that automation may well "provide the solution to some of the human problems mechanization has brought with it.

"The jobs of today's industries which are chiefly repetitive jobs, will be replaced by the jobs of automatic controls. The jobs that will be created, in addition to the obvious scientific and design positions, will be the

maintenance jobs, permitting a higher degree of freedom and individual satisfaction in the work," Diebold declared.

In addition to using human labor more efficiently, Diebold said that automatic plants, by operating production machinery on a 24-hr., rather than an eight-hour basis, utilize material resources of plant and equipment far more efficiently than plants which cannot normally run on a 24-hour-day basis because of the inconvenience to the working force and of employing three shifts.

U. S. Potash Producer To Prospect in Canada

Potash Co. of America will prospect for potash on 100,000 acres near Saskatoon, Saskatchewan, Canada. This exploration will cost about $220,000. The permit, already granted, may be converted to a lease on part of the land, not exceeding 10,000 acres, if potash ore is discovered within three years.

Operations at the company's Carlsbad, N. M., mine are at depths of 700 to 1,200 ft. Potash occurs in the Saskatchewan area at depths of more than 3,000 ft., and commercial possibilities have yet to be determined.

Potash Industry Expands To Meet Increased Demand

Heavy investment in plant expansion plus greater mechanization have enabled potash producers in the Carlsbad, N. M., area to keep pace with the growing demands of the fertilizer and chemical industries, according to A. B. Chafetz and E. C. Skinner of International Minerals & Chemical Corp.

Current construction in the Carlsbad basin already totals over $12 million, Chafetz declares, and tentative expansion plans call for the outlay of many more millions of dollars.

Underground developments include the introduction of continuous miners, jumbo drills, diesel-electric locomotives and diesel shuttle cars, with one mine undertaking the design and construction of its own continuous mining machine. Mine locomotives now in use range up to 40 tons in weight, with automatic current-limiting dynamic braking being used to brings loads down 6 percent grades safely.

Portable mine power centers have been introduced underground, Cha-

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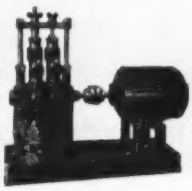

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H_2O	0	72 hr.	86 hr.
10% HCl	0	6 min.	4 hr.
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fetz adds, and primary electric distribution systems have been changed from 2,300 v. to as high as 12,470 v.

Some Carlsbad mines are using belt-conveyor gathering systems and are contemplating use of main-line haulage belt conveyors. Most mines now have automatic hoists, and one mine is installing a remotely controlled automatic mine hoist, which is operated by a hoistman located at the shaft collar.

Glyco Produces EDTA And Salts in Volume

In its plant at Williamsport, Pa., Glyco Products Co., Inc., is currently producing ethylenediamine tetraacetic acid and its salts in tonnage quantities. The acid and its salts are used in industry to contain troublesome trace metal impurities.

Textile processing and dyeing, soap and synthetic detergents, metal cleaning and plating, agriculture, cosmetics, leather, germicides and many other industries are consuming rapidly increasing quantities of EDTA and its salts. In the dyeing of textiles, for example, the presence of a small percentage produces brighter and more uniform shades with an actual over-all economy; in liquid soaps and shampoos, as well as in synthetic detergents, clarity and brightness are obtained, as the formation of impurities is prevented.

These compounds are stable and function efficiently in highly acid, neutral and strongly alkaline solutions. They work by complexing or sequestering the trace metal impurity so that it is rendered harmless under processing conditions.

Titanium Race Steps Up As Crane Makes Its Bid

A new $25 million titanium plant of Cramet Inc., wholly owned subsidiary of Crane Co. of Chicago, will be built by Vitro Corp. of America. It will be erected on a 200-acre site near Chattanooga, Tenn., two miles downstream from the TVA's Chickamauga Dam.

The new plant will step up U.S. production of titanium sponge by 6,000 tons annually. It will get into partial production in 1954 and full production a year later.

It will include facilities for turning out ingots of titanium and titanium alloys, as well as sponge.

Titanium is essential in aircraft production, and much of the initial output will be channeled to meet U. S. Air Force requirements. Later, however, Crane foresees the use of titanium in valves and fittings for use under highly corrosive conditions.

The government is required to buy 6,000 tons during the five years of the contract, and has the option of buying up to 7,500 tons. Under the $25 million Defense Materials Procurement Administration contract, the government will advance up to $24,950,000 for construction and equipment.

Like other present producers, Cramet will use a modified Kroll process, essentially the magnesium reduction of titanium tetrachloride. Together with sponge output of Du Pont and Titanium Metals, likewise contracted for by DMPA, the new production will bring total U. S. sponge production to 13,200 tons a year by 1955.

Coenzyme: A new coenzyme, uridine triphosphate, has been isolated by researchers of Pabst Brewing Co. and the University of Wisconsin from pure culture yeast, a byproduct of beer brewing. An ion exchange method was employed on yeast-derived nucleotides to isolate the new coenzyme. UTP is costly to produce. Pabst will sell it for $9,975 per oz. It will be used in milligram quantities primarily for research. UTP will be used in cancer research.

Fluorspar: Since U. S. demand outstrips U. S. production, imports of high-grade fluorspar have climbed more than 35 percent above 1952. Ozark-Mahoning Co. of Tulsa, Okla., has called upon the U. S. Tariff Commission to investigate the situation. Ozark-Mahoning is a U. S. producer. Value of imported ores containing more than 97 percent calcium fluoride reached $5,773,550 during 1952, will be even higher for 1953, with the total for the first half year at $3,883,000. From 1943 through 1950, duty on high-grade fluorspar was $3.75 per ton, but this was lifted to the statutory limit of $5 per ton after the reciprocal trade agreement with Mexico, the largest foreign supplier, was abrogated.

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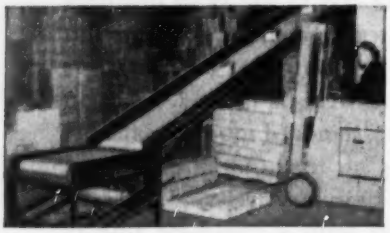

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THIS MONTH'S

Technical

Survey

SYNTHETIC METHODS OF ORGANIC CHEMISTRY. Vol. 7. By W. Theilheimer. Interscience Publishers, New York, 450 pages. $14.90.

Reviewed by Edgar A. Steck

Dr. Theilheimer has continued to devote his full efforts to the production of the annual survey of methods employed in the synthesis of organic compounds, the volume at hand covering 1950 and 1951. As has been indicated in our reviews of previous volumes, the system of classification involving the chemical bonds has marked utility in such a series and permits ready reference to a variety of types related to problems at hand for the research man.

It is also of potential value to those in development who wish to check on backgrounds. There has been no slackening in the efforts to produce a thorough, useful series with substantially no errors.

The chief error which seems to have arisen in recent volumes lies in the cost: the price has been increased too much for the comfort of the workers who should have copies of Theilheimer. It may well be that the sales will drop steeply as an indication that few besides libraries can afford these books, valuable though they are; such would be unfortunate for all concerned. The only other criticism of the present volume of this fine work lies in the pale, too-easily-soiled binding.

Company History

THE NORTON STORY. By Mildred McClary Tymeson. The Norton Co., Worcester. 312 pages.

Reviewed by Blaine K. McKee

For 68 years the Norton company has been manufacturing abrasives and machines to use them. In "The Norton Story" Mildred Tymeson skillfully traces the story of this successful company.

She spent nearly two years in writ-

Bookshelf

L. B. Pope

ing the history and has done an excellent job. She writes like one who had been with the company since its beginning. She truthfully states, "I have crammed Norton Company's sixty-eight years into two short intense years of my own life." Mrs. Tymeson does not begin her story, however, with the founding of the Norton Emery Wheel Co. in 1885, but sets the stage for its founding by telling of the events during the earlier parts of the century that made the formation of the new company possible.

Many people crowd the pages of her history and everyday small events have the importance in her story that they do in everyday life. You learn not just about the officials, but also about the switchboard operator, the company cook, the typist, and the plant worker. You read of the Christmas parties, the company picnics, and

RECENT BOOKS RECEIVED

Atomisation of Liquid Fuels. By E. Giffin & A. Muraszew. Wiley. $6.

Bleaching of Pulp. Technical Assn. of the Pulp & Paper Industry. $5.

Chemical Methods in Industrial Hygiene. By F. H. Goldman & M. B. Jacobs. Interscience. $3.75.

Chemistry of the Lanthanons. By R. C. Vickery. Academic. $6.

Dislocations in Crystals. By W. T. Read, Jr. McGraw-Hill. $5.

Electroanalytical Chemistry. By J. J. Lingane. Interscience. $8.50.

Elementary Quantitative Analysis. By R. L. Van Peursem & H. C. Imes. McGraw-Hill. $4.50.

Fourth International Symposium on Combustion. Williams & Wilkins. $7.

General Chemistry. 2nd ed. By L. Pauling. Freeman. $6.

Hydrocarbons From Petroleum. By F. D. Rossini, B. J. Mair & A. J. Streiff. Reinhold. $18.50.

Imidazole and Its Derivatives. Part I. By Klaus Hofman. Interscience. $13.50.

Inorganic Qualitative Analysis. 3rd ed. By H. A. Fales & F. Kenny. Appleton. $3.

Metallurgical Dictionary. By J. G. Henderson & J. M. Bates. Reinhold. $8.50.

Organic Protective Coatings. Ed. by W. Von Fischer & E. G. Bobalek. Reinhold. $7.50.

Temperature Measurement in Engineering. Vol. I. By H. D. Baker, E. A. Ryder & N. H. Baker. Wiley. $3.75.

Toxic Solvents. By Ethel Browning. St. Martins Press. $4.

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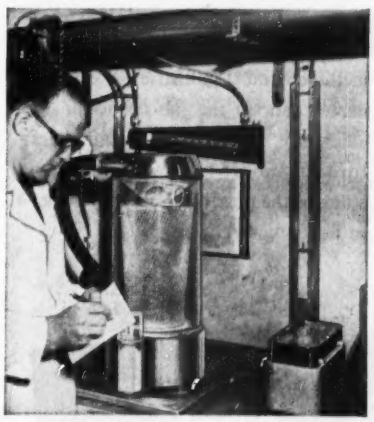

Model DC-9 has commercial applications in industries such as cosmetics or pharmaceuticals where small amounts of air are handled.

volve machines such as grinders, pulverizers, dryers, roll stands, purifiers, solvent extractors, mixers, open conveyors, blenders, etc. It has already been production-tested in industries ranging from food to pharmaceuticals, from abrasives to fertilizers.

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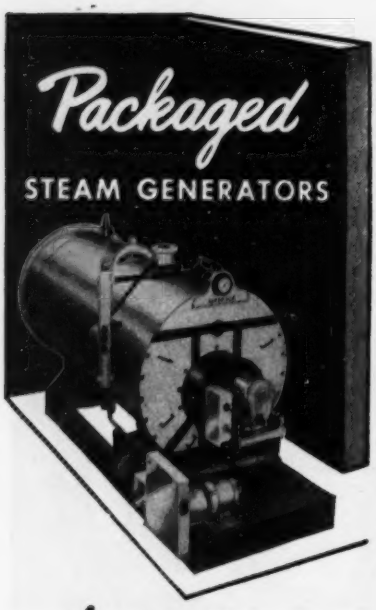

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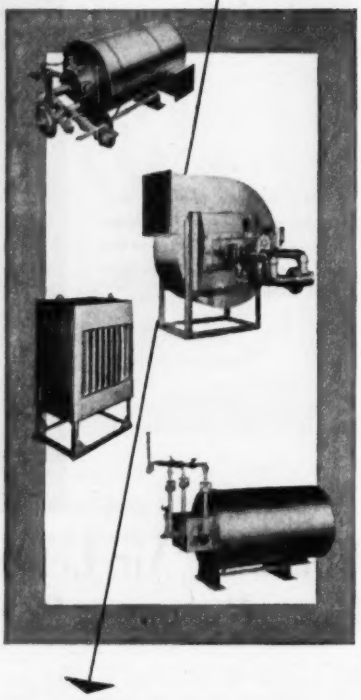

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Solid Non-Metals

PHOTOCONDUCTIVITY IN THE ELEMENTS. By Trevor Simpson Moss. Academic Press, New York. 263 pages. $7.

Reviewed by Arthur L. Levy

This book is concerned with the various photoconductive and other photoelectric effects, together with those electrical and optical properties of solid non-metals which have a direct bearing on these effects. It is in two parts: the first, theory; the second, experimental methods and results.

The theoretical part covers such topics as energy bands in solids, Hall effect, optical properties of materials, photocurrents and photovoltaic effects, response times and activation energies, threshold wavelength and refractive index.

The experimental part systematically covers all those elements which are not metals and which have a refractive index greater than 2. These are the ones which the author has postulated as likely to be photoconductive. Altogether there are 12 elements for which the author gives experimental results, methods of preparing films, layers and cells. The elements covered are B, C, Si, Ge, Sn, P, As, Sb, S, Se, Te and I.

The material, both theoretical and experimental, is presented in a very compact but thorough manner. All topics pertinent to photoconductivity will be found but some considerably condensed. However, a very comprehensive bibliography is included for the reader who is interested in more details. The book is an excellent review and critique of information available on photoconductivity up to 1952 and also includes many results obtained by the author in his laboratory that have not been published elsewhere. It will serve as a very good reference work for anyone concerned with photoconductors.

Catalogued by Formula

CRYSTAL STRUCTURES. Section III and Supplement II. By Ralph W. G. Wickoff. Interscience Publishers, New York. $14.50 and $4.

Reviewed by Joseph S. Lukesh

The appearance of the third section of "Crystal Structures" marks the formal completion of the series. Still unpublished are Chapters XI and XII of the second section. The present volume is devoted to organic compounds and consists of three chapters, one on aliphatic compounds, one on benzene derivatives and the last covering acyclic and heterocyclic compounds and carbohydrates. The chapter on aliphatic compounds was originally released with the second section in 1951. It is brought up to date with Supplement II. The format is, of course, the same as in the previous sections. Chapters are divided into four parts: text, tables, illustrations and bibliography.

In considering the three volumes as a unit, the reviewer feels that Dr. Wyckoff has accomplished a difficult task in a highly commendable manner. Of particular value to the chemist is his choice of the chemical formula type as a basis for cataloguing the structures. One might wish that the structure type assigned in the *Strukturbericht* had been included, but this is a trivial complaint.

Obviously, no compilation of such data as are included in this work can be done in such a manner as to satisfy everyone completely. The reviewer, for instance, has often wished that crystal structure data were compiled by elements. Perhaps some ambitious author will some day provide an index to "Crystal Structures" on this basis.

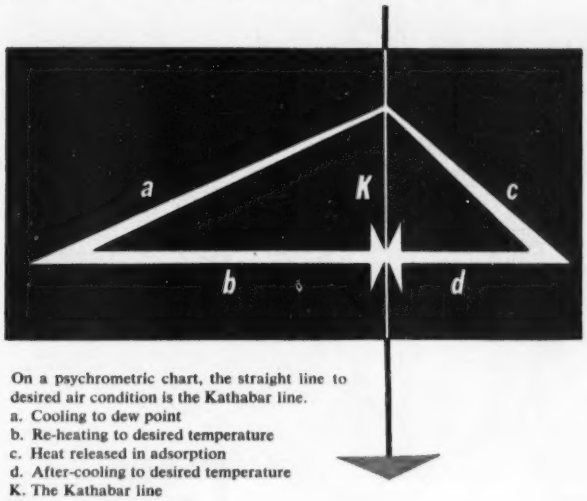
Best Available

INTRODUCTION TO SOLID STATE PHYSICS. By Charles Kittel. John Wiley and Sons. 396 pages. $7.

Reviewed by W. W. Tyler

Prof. Kittel's book is "intended as an introductory textbook in solid state physics for senior and beginning graduate students in physics, chemistry and engineering." In the reviewer's opinion, it is the best text available for this purpose. It also serves as a concise review of postwar develop-

how



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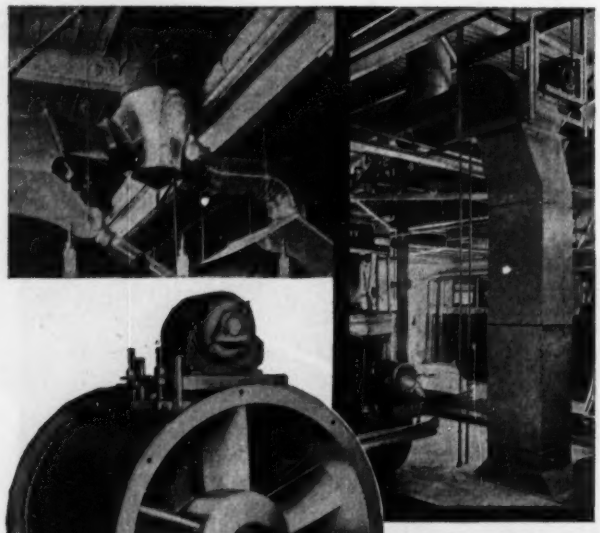
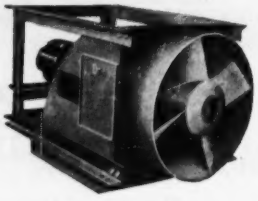


Upper left: Wingfoil Straight-Line Duct Fan in Textile Mill. Upper right: Wingfoil Elbow Type Duct Fan exhausting gases in a Garage.

Wingfoil Straight-Line Duct Fan



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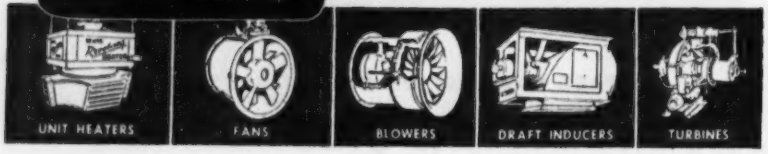

ments in the fields of solid state physics which are discussed. Beginning with a chapter on the classification of solids and crystal structure, the author proceeds to outline the theory of ionic crystals, elastic and thermal properties of lattices, dielectric and magnetic properties of crystals, the free electron theory of metals and the band structure of solids. Separate chapters are devoted to the active fields of superconductivity, semiconductors and imperfections in solids. Emphasis has been placed on subjects most susceptible to theoretical analysis. No attempt has been made to include the important fields of surface physics, electron physics or the metallurgical properties of solids.

The author makes effective use of diagrams, models and graphical and tabular representation of data. Whenever possible, mathematical development of theoretical models is preceded or accompanied by intuitive physical discussion and emphasis is placed on numerical values of physical properties discussed. Problems are provided at the end of each chapter. Most of the detailed mathematical developments are included in an appendix. The book provides an excellent bibliography of literature relevant to the topics discussed.

Important Ideas

MECHANICAL PROPERTIES OF WOOD AND PAPER. Edited by R. Meredith. Interscience Publishers, New York. 298 pages. $7.25.
Reviewed by J. A. Van den Akker

Because cellulose is the important structural constituent of both wood and paper, and in view of the common interest in rheology of the principal authors, the editor has combined two shorter books. These are Part A, dealing with the mechanical properties of wood and their relation to moisture, comprising 98 pages written by W. W. Barkas and R. F. S. Hearmon (who prepared Chapter II on the elastic and plastic properties of wood), and Part B, on the mechanical properties of paper, by H. F. Rance, who wrote the last 183 pages.

Although these major portions of the books are not well co-ordinated, the authors have each contributed

ideas of importance to basic research on both wood and paper; accordingly, it is recommended that the book be studied by investigators doing fundamental research in either field.

As in the study of almost any good book written primarily for research people, the reader of this pair of treatises finds himself challenging several of the theories which the authors set forth. Students and others having only a recent interest in either field should be referred to this book with the admonition that the book be studied critically, with frequent and intensive reference to the related literature.

The core of Part A has already been published by Barkas in his "The Swelling of Wood Under Stress" ("a discussion of its hygroscopic, elastic and plastic properties"), a designation which fits the subject matter of Part A more accurately than does the present title. The modern engineer (who, incidentally, is not unfamiliar with the technology of creep and stress relaxation in structural materials) will find the coverage of Part A far less comprehensive than the title. Barkas has consciously omitted "direct mention of a great many measurements which have been made with a more utilitarian aim and which were not intended to provide a comprehensive perspective of rheological problems" (quotation from his preface). However, the engineer who is already familiar with such thorough-going treatments of the subject as Wangaard's "The Mechanical Properties of Wood" will find Barkas' discussion and thermodynamic considerations to be of great interest.

Following an introductory chapter which includes preliminary remarks on gels and swelling stresses and anatomical and molecular considerations, Chapter II (by Hearmon) presents a review of the elastic and plastic properties of wood. This is followed by three chapters, comprised principally of Barkas' contributions to the thermodynamics of the hygroscopic properties of wood and of the swelling of wood under mechanical stress.

Of considerable interest is Barkas' explanation of sorption hysteresis, which rests on the influence of plasticity and stress relaxation on the moisture content (for a given water vapor pressure). Concerning his theory, Barkas states, "The above analysis does not constitute a proof that the only cause of sorption hysteresis lies in the

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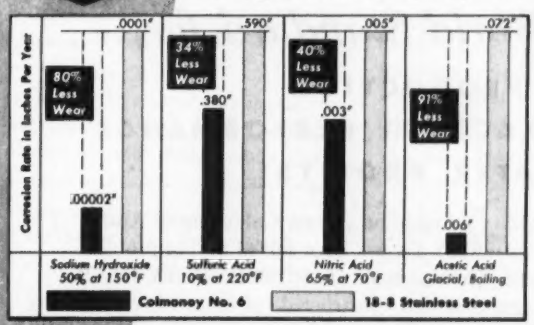

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plasticity of the sorbing material, but it does show the inevitability of the converse, namely that where plasticity is present hysteresis must result." Barkas presents no data or numerical estimates to indicate whether hysteresis resulting from plasticity would be a significant or major component of actually observed hysteresis.

A greater number of typographical errors than one is accustomed to see in modern technical books and several carelessly worded sentences detract somewhat from the value of this portion of the book.

This reviewer feels that the clarity of presentation of the difficult subject matter of Part A could be greatly improved if the author would study the wording and structure of all the sentences on which the understanding of the reader critically depends. It seems likely that the presentation of some of the theories would be greatly improved by simple amplification. Some statements of the author appear to be categorical and without justification. These are regarded by this reviewer as unfortunate disfigurements of Part A, which contains many ideas and discussions of importance; it is hoped that these liabilities will be eliminated in a further issue of the book.

Although the accent in Rance's portion of the book, Part B on "The Mechanical Properties of Paper," is rather heavily on the "rheology" of paper, the coverage is quite comprehensive. The reader unfamiliar with paper-making is introduced to the subject in Rance's first chapter, which presents the essential facts about the paper-making process in an interesting and effective manner.

This is followed by brief but critical descriptions of the several most popular mechanical tests that are used for the control and specification testing of paper. In his third chapter, Rance discusses the hygrosensitivity of paper in relation to its rheology, with particular reference to the effects of manufacturing variables and to the connections between hygrosensitivity and testing procedures and the mechanical characteristics of paper. A critical historical review of load elongation testing of paper is given in the next chapter; this should be of value and interest to all paper technologists.

In the next four chapters, Rance discusses the interpretation of load-elongation curves for paper; the effect

of structure on such curves (especially from the point of view of theory), and of strain-hardening and relaxation, and of beating; analogies with the behavior of cellulose acetate, metals and wool; and considerations on the compressibility, softness and folding endurance of paper. Instrumentation for the autographic recording of load-elongation curves of paper is discussed in Chapter IX.

In the final chapter of the book, Rance presents the ideas of Steenberg and coworkers at Stockholm, of his own, and of others, on the practical applications of load-elongation data. Topics covered in this chapter are the practical importance of stress-relaxation, of permanent set, of hygrosensitivity, and of anisotropy, and discussions of the problems of production, control testing, and usage of paper are given.

Rance and his coworkers have done a considerable amount of mill research on the properties of paper, and they have introduced a number of the ideas that are currently employed by paper technologists. It is natural and desirable that appreciable space is given in the later chapters of Rance's portion of the book to a discussion of those ideas. Rance would be among the first to admit that some of the ideas are debatable, as he emphasizes the need for more basic information; a few of the ideas, in the opinion of this reviewer, are of doubtful validity.

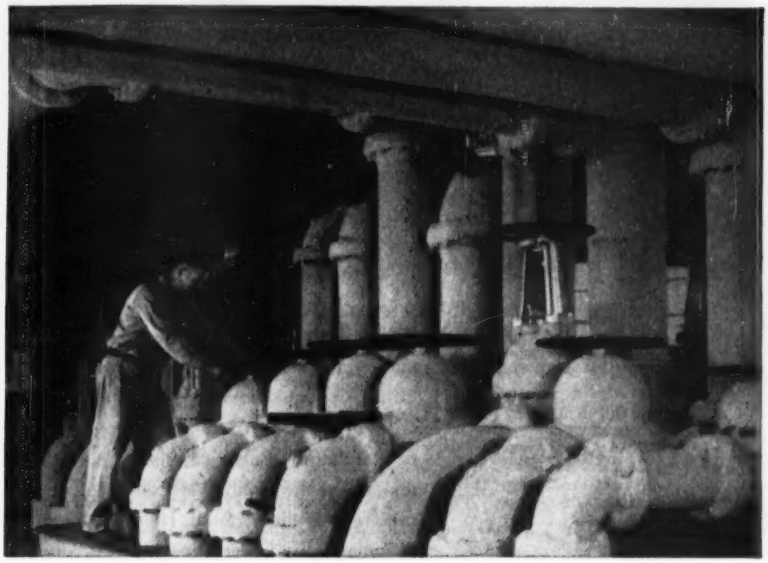
This reviewer considers it unfortunate that the word "rheology" has come into use in connection with the mechanical properties of paper; it is felt that the elastic characteristics of paper are quite as important as the "flow" phenomena, and that existing terminology, such as "visco-elasticity," "creep," and "stress-relaxation" are adequate. One gets the impression, on reading this book, that the mechanical properties of paper should most logically be investigated by the "rheologist," an impression which the authors probably did not intend to convey.

Rance's contribution to this book is imaginatively written, and is relatively free of errors; the axes of some of the figures are erroneously labeled, and there are a few typographical errors.

In any event, Part B of this book is provocative, interestingly written, and valuable for the many good ideas which Rance sets forth.

LARGE DIAMETER PIPING HANDLES DE-IONIZED WATER

Installation of large diameter SARAN RUBBER lined pipe, fittings and valves safely transports de-ionized water without contamination



Saran rubber has served over three years in this water-conditioning plant without a shutdown. De-ionized water for chemical processing is transported and stored with complete safety in pipes and tanks lined with saran rubber.

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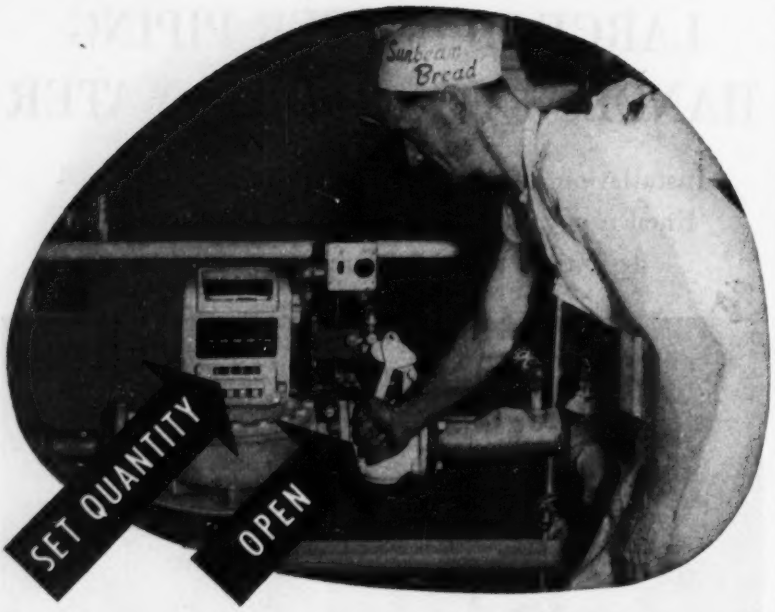

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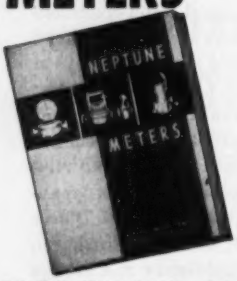

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Recent Books

Distillation

A handy volume that could well be used as the take-off point of a literature search on any phase of distillation. Indexed by subject and by author, it's easy to locate either a particular paper which interests you, or everything that's been published on the subject in a 7-yr. period. This volume supplements a previous index covering 1941–45. 300 pages.

"Distillation Literature Index and Abstracts, 1946-52." by Arthur and Eliabeth Rose, Applied Science Laboratories, Inc., 140 N. Barnard St., State College, Pa. $25. (separate pages 10 cents per page.)

Research and Development

This Bureau of Labor Statistics Report is a comprehensive study on the costs of industrial and institutional research and development and on manpower engaged therein. Includes hitherto unpublished data on almost every phase of industrial research. 106 pages.

"Scientific Research and Development in America." U. S. Dept. of Labor Bull. No. 1148, Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 50 cents.

Bureau of Standards

Report on the operations and functions of the National Bureau of Standards in relation to present national needs. Result of an extensive examination of the Bureau's activities, organization, personnel and facilities. Includes recommendations for improving the Bureau. 110 pages.

"Report on the Operations and Functions of the National Bureau of Standards." Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

& Pamphlets

Gas Viscosities

Experimental determinations of the absolute viscosity of methane and 3 natural gas mixtures at pressures up to 10,000 psi, and temperatures from 70 to 250 deg. F. Data are presented in the form of viscosity-pressure isotherms showing the effects of temperature, pressure and composition on viscosity. 60 pages.

"Viscosities of Natural Gas Components and Mixtures." by N. L. Carr, Institute of Gas Technology, 17 W. 34th St., Chicago 16, Ill. $5.

Iron and Steel

Classified listing of the more important books and trade publications on this subject in 1952. Covers government and foreign publications as well. Reprinted from *The Blast Furnace and Steel Plant*. 34 pages.

"Review of Iron and Steel Literature for 1952." by V. S. Polansky, Technology Dept., Carnegie Library of Pittsburgh, Pittsburgh, Pa.

Steel Painting

Specifications for the pretreatment of steel prior to painting the presented in four volumes, each describing a specific treatment. Another booklet gives detailed paint application specifications.

"Pretreatment Specifications." (a set of four), and "Paint Applications Specifications." Steel Structures Painting Council, 4400 Fifth Ave., Pittsburgh 13, Pa. 60 cents and 50 cents respectively.

Directory

Listings of all manufacturers in Maryland, Virginia, West Virginia, Delaware and the District of Columbia. Listings are alphabetical, geographical, by products and by trade names. Gives name, ad-

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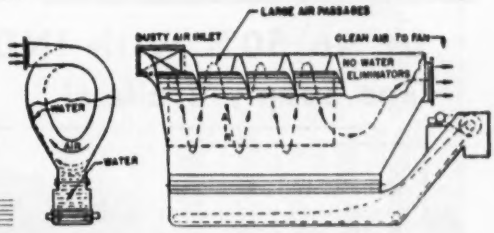

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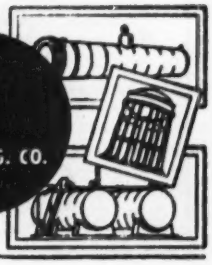

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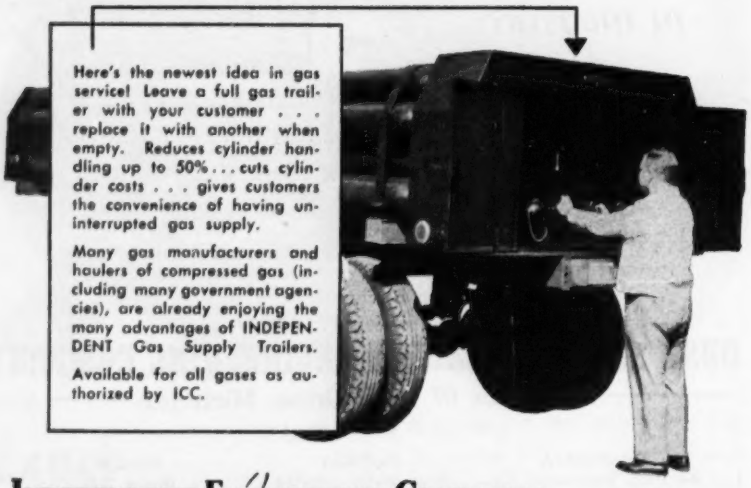

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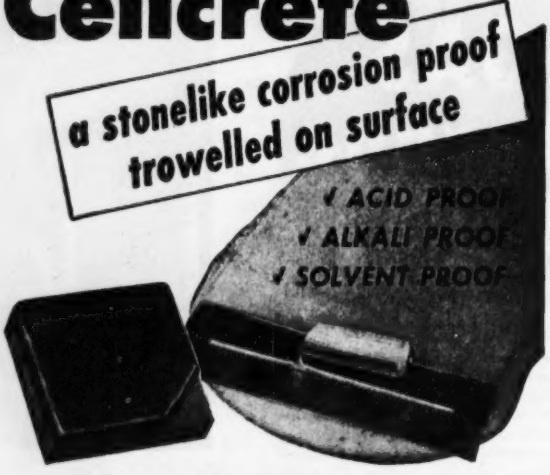

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dress of firm, officials, employment and synopsis of products. 520 pages.

"Central States Manufacturer's Directory." T. K. Sanderson Organization, 200 E. 25th St., Baltimore 18, Md. $30.

Mass Spectrometry

Discussion of the analytical applications of mass spectrometry. Includes special problems of spectrometer design and techniques of analysis, as well as some results obtained from specific applications. 40 pages.

"Symposium on Chemical Analysis of Inorganic Solids by Means of the Mass Spectrometer." American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $1.25.

Coal Research

Summarizes the research and technological work on coal which was conducted by the Bureau of Mines in fiscal 1952. Seventeenth in the series of annual reports, it includes some data not previously published. 67 pages.

"Annual Report of Research and Technological Work on Coal and Related Investigations, Fiscal Year 1952." Information Circular 7663, Publications Section, Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa. Gratis.

Metals Analysis

Describes how to get a qualitative determination of most metallic elements by the visual-arc spectroscopic method. 20 pages.

"Visual-arc Spectroscopic Analysis." Bureau of Mines Bull. 524, Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 75 cents.

Patents

Booklet designed to show the role of patents in the economic life of the country. Tells what U. S. patents are, why they're granted and the benefits they bring. Attempts

to answer questions about patents and their place in our competitive economy. 20 pages.

"Patents . . . Progress . . . and Prosperity." by William R. Ballard, National Association of Manufacturers, 14 W. 49th St., New York 20, N. Y. Gratis.

Plastics Testing

A symposium reviewing the present state of plastics testing. Covers a wide range of topics touching nearly every phase of the subject. 71 pages.

"Symposium on Plastics Testing—Present and Future." American Society for Testing Materials, 1916 Race St., Phila. 3, Pa. $2.

Radioactive Products

Second printing of a report on the findings of a team of economists, market analysts and engineers. Describes specific industrial applications of radioactive wastes from the operation of the AEC's nuclear reactors.

"Industrial Uses of Radio-active Fission Products." Public Relations Office, Stanford Research Institute, Stanford, Calif. $1.50.

Thermal Conductivity

Thermal conductivity of wood of various moisture contents has been determined for 32 species. Formulas and chart accompany the text. 5 pages.

"Computed Thermal Conductivity of Common Woods." Forest Service, Technical Note No. 248, Forest Products Laboratory, Madison 5, Wis. Gratis.

Explosibility

Results of studies on the explosibility of ammonium nitrate, both pure and fertilizer grade. Conditions under which a combination of heat and pressure will cause this chemical to explode are described. Illustrated. 19 pages.

"Investigations on the Explosibility of Ammonium Nitrate." Report of Investigations 4994, Publications Section, Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa. Gratis.

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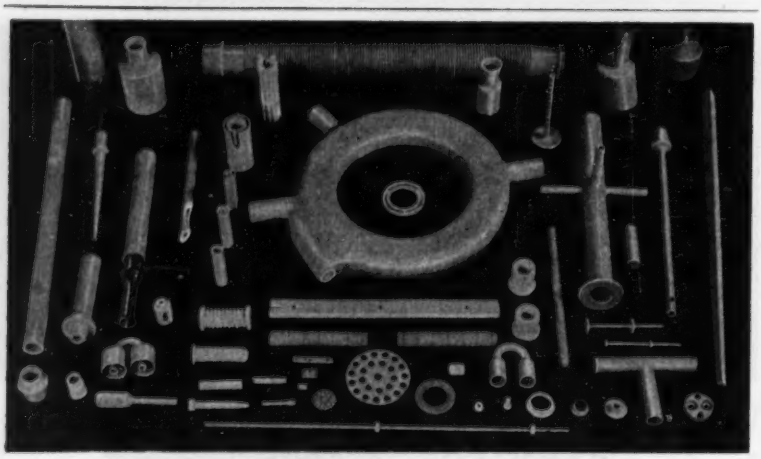

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Firms in

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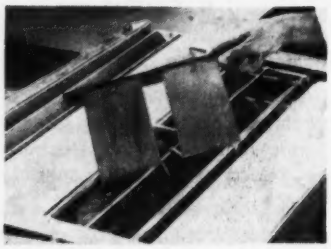


Pennsylvania Salt Mfg. Co.—Enters the field of chemical specialties, for phosphatizing metals in corrosion resistance and paint bonding, with a complete line of products under the trade name "Fosbond." The new item rounds out Pennsalt's line of phosphate coatings, metal cleaners and lubricants for the cold working of steel.

Lukens Steel Co.—A special steel for sulphate digesters in response to widespread demand from the paper pulp industry. The steel is of the rimming type and has the characteristics necessary for easy fabrication of the heavy gauge metals used in digester service.

Filtrol Corp.—An added line of "natural" clay catalysts for oil refining and other applications. Production of the catalysts may be handled in part at the firm's Salt Lake City plant.

Pipe Linings, Inc., Los Angeles—Has acquired all patent rights and licenses for the manufacturing and distributing (in 11 western states) of the Somastic pipe coating process—used in the exterior treatment of steel pipe against possible corrosion. The new line was added upon acquisition of the Somastic Div. formerly of Bechtel Corp., San Francisco.

Rempe Co.—A line of fin and pipe coils of stainless steel used in handling acids in cooling and heating processes. The manufacturer, located in Chicago,

furnishes gas tight or standard type fin coils while pipe coils can be designed for individual requirements from all types of stainless steel.

Sheffield Corp., Dayton, Ohio—Will design, manufacture and market Cavitron machine tools by arrangement with the Cavitron Corp., Long Island City, N. Y. The tool is a device which utilizes an ultrasonic vibrating head and an inexpensive tool for the precision cutting of materials.

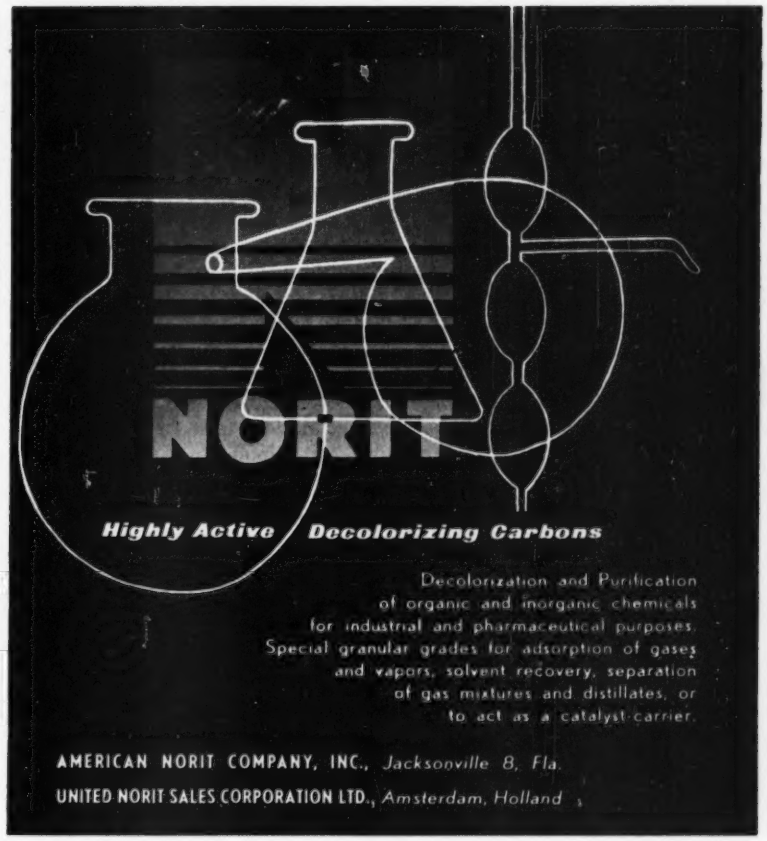
Hayden Twist Drill Co., Detroit & Los Angeles—A high speed twist drill will be added to its lines of adjustable and fluteless drills.

Instruments, Inc., Tulsa—Rad-O-Thik, the Penetron instrument as developed by the Texaco Development Corp., New York. The new line is an instrument designed to measure the wall thickness of pipe without requiring access to the inside of the pipe.

Harshaw Chemical Co.—Sodium methylate now being manufactured at the Gloucester City, N. J., plant. Cleveland is the locale of the firm's general offices.

Houdry Process Corp.—Will handle the refinery applications of the catalytic oxidation units manufactured by Oxy-Catalyst, Inc., Wayne, Pa. The oxidation catalyst is used in improving oxidation efficiency and in minimizing air pollution in industry.

Whittaker, Clark & Daniels, Inc.—Will handle special industrial sizes of vermiculite produced by Zonolite Co., Chicago. In the past, the product has been used principally for insulation, lightweight aggregates, sound absorption and agricultural applications.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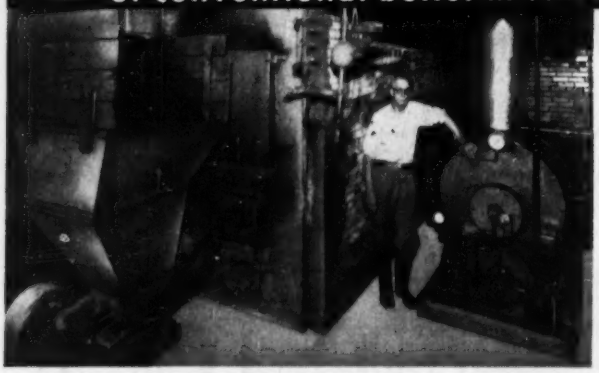

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FIRMS IN THE NEWS, *cont. . .*

New Companies

Zirconium Corp. of America—To manufacture various zirconium compounds and concentrate, particularly, on production of zirconium oxide. The new patented process to be employed in the firm's activities was developed by Sylvester & Co., a Cleveland engineering firm. The new company will be located in the Solon Center Bldg., Solon, Ohio.

Harry F. Kolb firm—To distribute casein, was organized by the former San Francisco manager of the paper makers chemical division of Hercules Powder Co. The company was formed after Hercules discontinued handling the product.

Burns & Roe of Michigan, Inc.—To serve more closely the growing practice, in the Great Lakes region, of the New York engineering firm—Burns & Roe, Inc. Detroit will be the location of the new subsidiary.

Elgin-Refinite, Inc.—A sales engineering organization composed of the combined staffs of the Refinite Sales Co., Omaha, and Elgin Softener Corp., Elgin, Ill., will handle the industrial water conditioning products and services of both companies. The new company will function as a division of the Elgin firm.

F. S. Stewart Associates—To enter the field of plastics and related organic materials as chemical research and engineering consultants. The new firm will be located at 10819 Venice Blvd., Los Angeles.

Robinette Research Laboratories, Inc.—To provide production and process development for the textile, leather, paper and chemical industries, as well as technical and economic surveys of the chemical process industries. The firm will be located in Ardmore, Pa.

H. K. Ferguson Co. of Canada, Ltd.—To offer engineering and construction services to industry

in Canada. The new company is a wholly-owned subsidiary of the H. K. Ferguson Co., Cleveland. Morrison-Knudsen Co., Inc., Boise, Idaho, is the parent company of both firms.

Polychemicals Div., West Virginia Pulp & Paper Co.—To embrace all phases of lignin operations, including production, product and uses development, sales and administration, for the firm. The Division will be under the direction of Dr. Paul Wiley, former director of the firm's Development Dept. in Charleston.

Engineering Research Institute, Tulane University—To serve the needs of the expanding industry of the New Orleans area. The Institute will contract with industrial firms for specific research projects involving practical problems in various engineering fields.

Components Div., Servomechanisms, Inc.—To produce miniature servo and instrument motors, mechanical development apparatus and other electronic and instrument products, in keeping with the firm's emphasis on decentralization. The division will be located in Westbury, L. I.

New Representatives

Insul-Mastic Corp. of America has selected Robert Lear & Son, Louisville, Ky., and The M. H. Ellis Co., Memphis, Tenn., as representatives in their respective areas for the firm's heavy, pressure applied and asphaltic type coatings.

Clark Equipment Co. has added Ross straddle carriers and fork truck lines to the line of materials handling equipment already handled by its various dealers. Among Clark dealers are the Industrial Truck Sales and Service Co., Lukas Equipment Co., M-H Equipment Co. and Dempster Bros., Inc.

Michigan Tool Co., Shear-Speed Chemical Products Div., Detroit, has named The Colonial Tool Co., Windsor, Ont.; the Moen Sales & Engineering Co., Flint,

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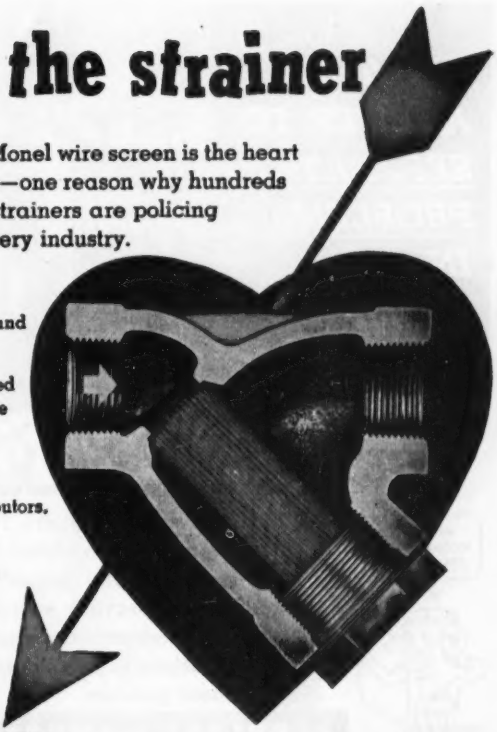

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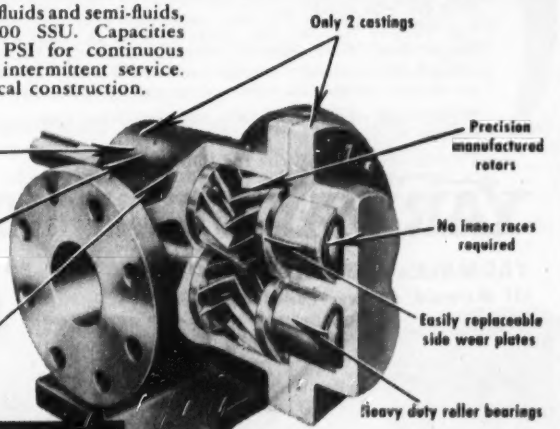
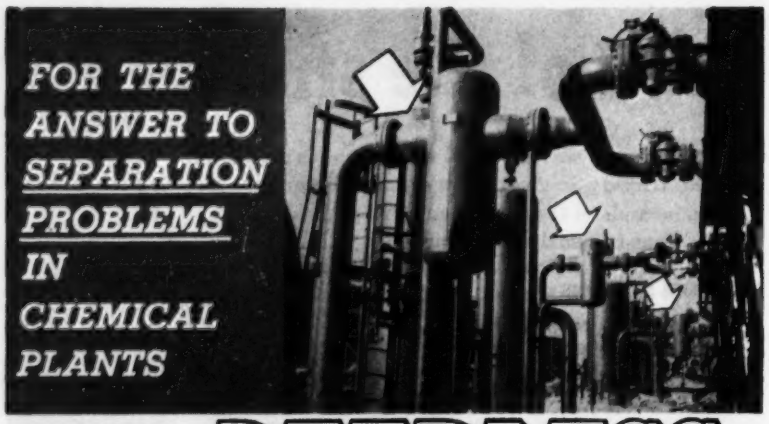

Only 2 castings
Hydraulically balanced axially
Precision manufactured rotors
Only one stuffing box (under suction pressure)
No inner races required
Shaft hardened and ground at stuffing box. Minimizes wear.
Easily replaceable side wear plates
Heavy duty roller bearings

Sier-Bath "HYDREX" Pumps

CALL your local Sier-Bath Pump Representative, or send for *Hydrex Pump Reply Sheet*. Read the front side for features . . . fill in the reverse side for prompt quotation. Sier-Bath Gear & Pump Co., Inc., 9259 Hudson Blvd., North Bergen, N. J., Founded 1905, Member A.G.M.A.

Sier-Bath Screw and "Gearex" Pumps for higher capacities and pressures . . . also mfrs. of Precision Gears and Flexible Gear Couplings



SEE PEERLESS

Shown above are five Peerless line separators on outlet lines from cooling tower efficiently extracting entrained liquid. Performance Guaranteed. Call Peerless to solve your entrainment problem.

PEERLESS MFG. CO.

PEERLESS MANUFACTURING CO.

P. O. BOX 7193 * DALLAS, TEXAS * Dixon-8431

REPRESENTATIVES IN ALL PRINCIPAL CITIES

for
• SPRAYING
• WASHING
• RINSING
• COOLING
• AIR CONDITIONING

Get the most out of your Spraying Equipment with minimum power . . . with efficient spraying.

Use Yarway Nozzles. No internal vanes or other restrictions to clog or hinder flow. Two types—Yarway Involute-type producing a fine hollow spray with minimum energy loss, and Yarway Fan-type producing a flat fan-shaped spray with time-saving slicing action for cleaning.

Wide range of standard sizes and capacities. Cast or machined from solid bar stock.

Thousands in use. Write for Bulletin N-617.

YARWAY SPRAY NOZZLES

YARNALL-WARING COMPANY
137 Mermaid Avenue, Philadelphia 18, Pa.

FIRMS IN THE NEWS, *cont.* . .

Mich.; A. F. Olson, Buffalo, N. Y.; and J. R. Armstrong, Indianapolis, Ind., as representatives of its new industrial coolant-lubricant.

Universal Detergents, Inc., Long Beach, Calif., has chosen the Jameson Chemical Co., Chicago; M. H. Baker, Minneapolis; and J. W. Copps, Milwaukee, to handle its line of alkyl aryl sodium sulfonate detergents.

Beckman & Whitley, Inc., San Carlos, Calif., has appointed R-O-R Associates, Ltd., Toronto, as representative in the Dominion of Canada for its line of instruments for industrial air-pollution work.

Livingstone Engineering Co., Worcester, Mass., has appointed the Mid-west General Corp., Detroit, as representatives and field engineers for Livingstone's "Speedylectric" boilers and steam-jet cleaners.

New Services

Monsanto Chemical Co., Plastics Div.—A $1,250,000 technical service and development program that will include a new research center for customers and industry in the plastics field. Surface coatings and foundry resins are among specific products already slated for study.

Southwest Research Institute—An expansion of its public service program to include publication of a monthly technical calendar for free distribution to 25,000 scientists and engineers in the Texas region.

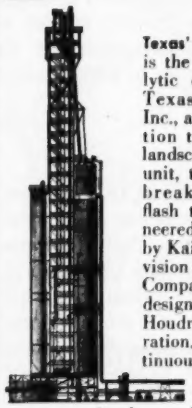
New Names

Burgess Chemical Co., Newark, has changed its corporate name to Cary Chemicals, Inc. The firm is a manufacturer of its own line of vinyl compounds, stearine pitches and other related materials for the rubber and plastics industries.

"Spun-Dyed Fibro," a solution-dyed rayon staple developed by Courtaulds Ltd., England, will

what's NEW in Engineering

An ingenious new alarm system which automatically sounds a warning when overloaded industrial equipment gets too hot, is said to be the answer to the problem of having to feel bearing cases and check thermometers scattered over a wide area. The moment a motor gets "too darn hot", a bulb lights up, and a central monitor gives out an audible alarm.



Texas' newest landmark is the Houdriflow catalytic cracking unit of Texas City Refining, Inc., a spectacular addition to the southwest landscape. The cracking unit, together with visbreaker and vacuum flash tower, were engineered and constructed by Kaiser Engineers Division of Henry J. Kaiser Company from the basic designs prepared by the Houdry Process Corporation. A new-type continuous bulk handling system for fresh catalyst and a new, centralized control system were also designed and built by Kaiser Engineers' process specialists.

To be published January 1, 1954 by McGraw-Hill is the Third Edition of **Formulas for Stress and Strain** by Raymond J. Roark, Professor of Mechanics, University of Wisconsin. This thorough revision of a working handbook for engineers concerned with machine and structural design contains a summary of important formulas, facts and principles pertaining to strength of materials.

An indication of Kaiser Engineers' activity is the fact that more than 6,000,000 miles have been flown by key personnel, staying in touch with far-flung activities in widely diversified engineering fields. When you have a problem in design, engineering or construction, call or write: Kaiser Engineers Division of Henry J. Kaiser Company, Kaiser Building, Oakland 12, California.

Custom Built STAINLESS STEEL EQUIPMENT....

...is ONLY AS GOOD AS ITS FABRICATOR

From the minute you decide on a made-to-order stainless steel vessel, you're in the hands of a fabricator. In fact the selection of your fabricator is generally one of your big problems.

It's more than a question of following blueprints. Stainless steel is a difficult alloy to work. It "acts up" during fabrication. In cutting, forming, welding and even in finishing, your fabricator must know how to guard the corrosion resistance and strength of the alloy. His plant must be specially equipped for working with stainless steel. The longer his experience, the more help he'll give you in building vessels that meet your requirements.

We work exclusively with stainless steel and alloys. Our plant is specially tooled to fabricate this metal. Our engineers and mechanics are particularly trained for the work. Why not consult us when you plan your next stainless steel vessel?

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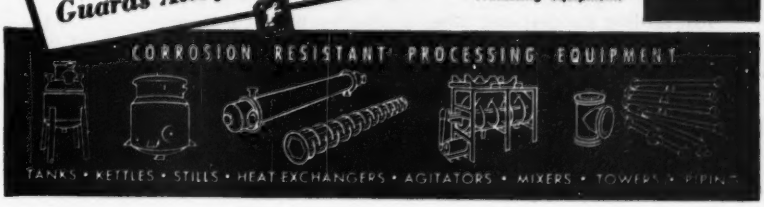
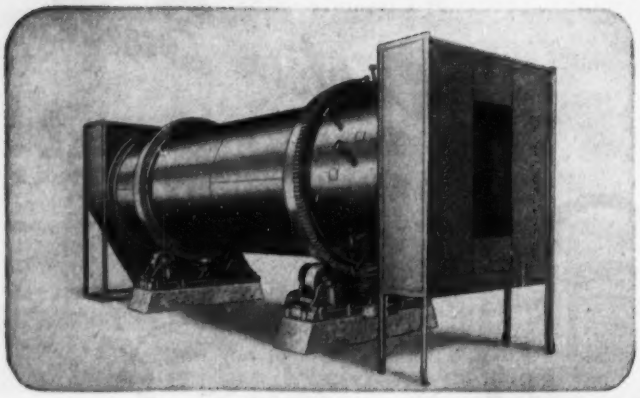
Guards Alloys in Fabrication

SEND FOR THIS VALUABLE BOOK
A request on your letterhead will bring our guide, "What to Look for When You Specify Stainless Steel for Your Processing Equipment."





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Used on materials requiring close temperature control. Illustration shows the type unit used for drying cereal by-product with heated air. Notice self-cocking knockers are provided to prevent sticky materials from adhering to inside of shell. Write for our illustrated catalog.

For quick reference see your 1953 or '54 Chemical Engineering Catalog.

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Water Tube and Air Coolers

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● Shriver "Filter Facts" contains useful information for the user of filtration and fluids-handling equipment.

The current issue includes articles on selection of filter media; drying of filter cakes; electrolytic regeneration of sour "gas" caustic scrubbing solution; wax cooling; filtering brewer's mash; pumping velocities and impending clogging in fast-settling slurries; and other interesting practical items.

Write us for the current issue of "Filter Facts" and others to come.

T. SHRIVER & CO., Inc. 802 Hamilton St. · Harrison, N. J.

Filter Presses · Filter Media · Diaphragm Pumps

be sold in this country by a subsidiary, Courtaulds, Inc., under the trade name, "Coloray."

Maumee Development Co., Toledo, Ohio, has changed its corporate name to Maumee Chemical Co. to more accurately describe its major activities. Its products are various manufactures of fine organic chemicals.

Colgate-Palmolive-Peet Co. has shortened its name to Colgate-Palmolive Co. No change in corporate entity is involved.

New Haven Pulp & Board Co., New Haven, will be known as the New Haven Board & Carton Co. in recognition of the increasing concentration of the firm's business in folding carton manufacturing.

New Locations

Columbian Carbon Co. has moved its executive offices to 380 Madison Ave., New York 17. Binney & Smith Co., distributor of Columbian's carbon blacks, bone blacks and iron oxide pigments, is also making the address change.

Permachem Corp., previously located at a New York address, will move its general office and development laboratories to 5610 Georgia St., West Palm Beach, Fla.

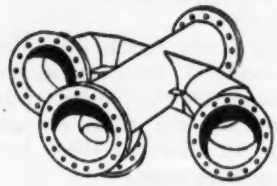
Interchemical Corp., Printing Ink Div., has moved its San Francisco IPI branch and district offices to new and larger quarters in its Oakland factory.

Sharples Chemicals Inc. has relocated its executive offices in new quarters at 1100 Widener Bldg., Philadelphia 7.

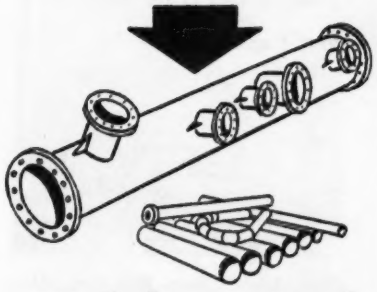
I-T-E Circuit Breaker Co., Special Products Div., Philadelphia, has moved from the company's main plant at 19th & Hamilton Sts., Philadelphia to 601 East Erie Ave., Philadelphia 34.

Atomic Industrial Forum, Inc., has moved to permanent quarters at 260 Madison Ave., New York

mpc piping



fabricated



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Specify MPC-FABRICATED pipe, tubing, fittings, assemblies and complex piping shapes. Available in both light and heavy wall carbon steel, stainless steel and Monel metal. Wall thicknesses from 5/64" through 1/2", internal diameters 6" through 48", lengths up to 20'. *Prompt delivery.* **ALSO MANUFACTURERS OF MPC WOOD-LINED STEEL AND SARAN RUBBER-LINED STEEL PIPE.**

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AT YOUR FINGER TIPS, issue after issue, is one of your richest veins of job information – advertising. You might call it the "with what" type – which dovetails the "how" of the editorial pages. Easy to read, talking your language, geared specifically to the betterment of your business, this is the kind of practical data which may well help you do a job quicker, better – save your company money.

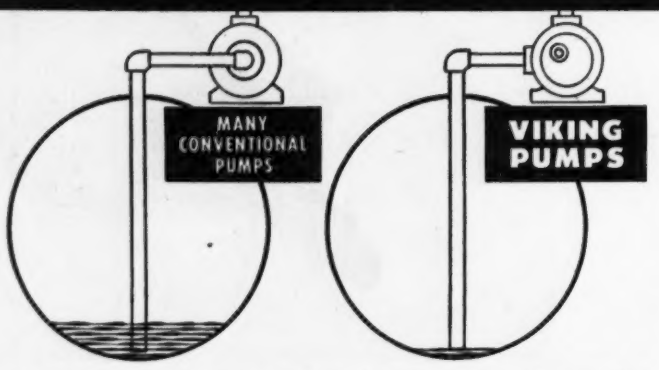
Each advertiser is obviously doing his level best to give you helpful information. By showing, through the advertising pages, how his product or service can benefit *you* and *your* company, he is taking *his* most efficient way toward a sale.

Add up all the advertisers and you've got a gold mine of current, on-the-job information. Yours for the reading are a wealth of data and facts on the very latest in products, services, tools . . . product developments, materials, processes, methods.

You, too, have a big stake in the advertising pages. Read them regularly, carefully to keep job-informed on the "with what" part of your business.

McGRAW-HILL PUBLICATIONS

GETTING TO THE BOTTOM OF THINGS



The difference to you between profit and loss can depend upon the simple, positive action of Viking Rotary Pumps. Their fast, thorough stripping action can mean that you get all you pay for when emptying barrels, tanks and other containers instead of leaving a part of each load. Where many other pumps fail, efficient stripping is possible with Vikings because of the suction lift created by our famous Viking "gear-within-a-gear" pumping principle.

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Whether the liquid you want to pump is thick or thin, you will pump more . . . faster with a Viking. What is your pumping problem? Send it along today and ask for Bulletin 545C.

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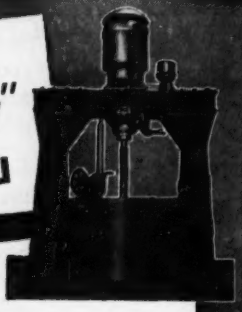


Our long Centrifuging Experience can help meet your problems

Fletcher engineers have worked with many of the leading chemical and process firms for years. From that combination has come a large number of very successful installations for Filtering, Separating, Extracting, Dehydrating or Clarifying operations. This same understanding of problems peculiar to those industries is available to you. Let's get together and talk things over.

FLETCHER CENTRIFUGALS

FIRMS IN THE NEWS, *cont.* . .

16. The firm was organized in the spring of 1953 as a non-profit organization.

Edgar Plastic Kaolin Co., Metuchen, N. J., has moved its home office to the Mines, Edgar Florida. The change was made in an effort to effect better customer service.

Arthur D. Little, Inc., has relocated its midwestern office in the Board of Trade Bldg., Rm. 3832, Chicago 4, Ill. The office, previously located in St. Louis, will conduct studies in the Midwest and further facilitate relations with clients in the area.

New Facilities

Barksdale Valves—New assembly plant and general offices, in Los Angeles, were acquired to help the firm keep pace with the increasing demand for hydraulic control equipment in the industrial field.

American Cyanamid Co.—An Antibiotic Division (including a Princeton, N. J., plant) acquired from the Heydon Chemical Co. will provide for Cyanamid's expansion in the field of penicillin, streptomycin and neomycin manufacturing. In addition, the firm has arranged with the Blaw-Knox Co. for the construction of a processing unit for the purification of solvents at the Wallingford, Conn., plant.

The New York Air Brake Co.—Presently contemplating a merger with the Kinney Mfg. Co., a subsidiary. The former company has a controlling interest in the Kinney firm—a manufacturer of vacuum pumps and pumps for the handling of viscous liquids.

Fischer & Porter Co., Hatboro, Pa.—A special products division has been created for the develop-

this man has ice water in his veins!

Of course he'd never volunteer to give blood, anyway. But any resemblance of this old duffer to the average, red-blooded American is a mistake.

For instance, several million healthy Americans have given blood. *But it's not enough.*

So this is to tell several million more Americans that their blood is needed—now!

We've never let anyone down who was in trouble. When a GI gets wounded and suffers *shock*—he's in bad trouble. He's got to have blood and lots of it! Folks here at home need blood too—to save their lives.

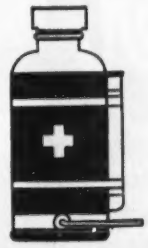
So make a date with your Red Cross, Armed Forces or Community Blood Donor Center. *One* hour and you're on your way.

BUSINESS EXECUTIVES
CHECK THESE QUESTIONS

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ◯ HAVE YOU GIVEN YOUR EMPLOYEES TIME OFF TO MAKE BLOOD DONATIONS?
- ◯ HAS YOUR MANAGEMENT ENDORSED THE LOCAL BLOOD DONOR PROGRAM?
- ◯ HAS YOUR COMPANY GIVEN ANY RECOGNITION TO DONORS?
- ◯ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ◯ DO YOU HAVE A BLOOD DONOR HONOR ROLL IN YOUR COMPANY?
- ◯ WAS THIS INFORMATION GIVEN THROUGH PLANT BULLETIN OR HOUSE MAGAZINE?
- ◯ HAVE YOU ARRANGED TO HAVE A BLOODMOBILE MAKE REGULAR VISITS?
- ◯ HAVE YOU CONDUCTED A DONOR PLEDGE CAMPAIGN IN YOUR COMPANY?
- ◯ HAVE YOU SET UP A LIST OF VOLUNTEERS SO THAT EFFICIENT PLANS CAN BE MADE FOR SCHEDULING DONORS?

Remember, as long as a **single** pint of blood may mean the difference between life and death for **any** American . . the need for blood is **urgent!**

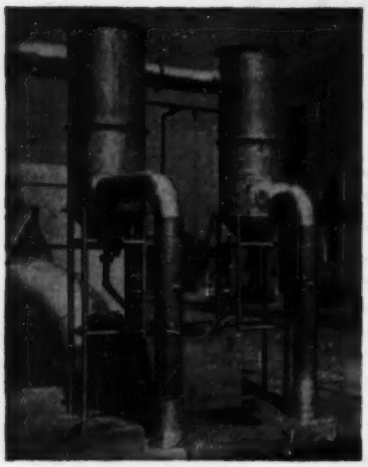


GIVE BLOOD

...give it again and again

NATIONAL BLOOD PROGRAM

MULTI-WASH can clean-up your chemical contamination



Dust, fumes, vapors, soluble gases, acid gases and odors are most effectively removed.

Schneible Multi-Wash Collectors provide efficient removal of air-borne contamination and recovery of product through multiple washing action.

The counterflow action allows air, gas or vapors to pass spirally upward through several stages at a velocity that impinges or condenses the contaminant against wetted surfaces, where they are flushed down and out the outlet cone in the liquid. The water or liquid enters the unit through a full-sized, non-clogging pipe opening so that heavy concentrations of slurry may be recirculated.

The intensive action of the air stream with the liquid curtains and spray patterns has proven very successful in the removal of soluble gases and acid gases. The liquid used varies according to type of material to be collected. Complex odors are removed by the addition of oxidizing agents in the recirculating liquid.

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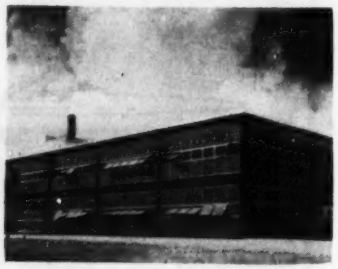

Borden Co., Chemical Div.—The acquisition of the American Polymer Corp., Peabody, Mass., is in line with the firm's policy of expansion in the field of basic chemicals. American Polymer plants (in Illinois, Montreal, Brazil as well as in Peabody) produce resine emulsions from base monomers. In addition, the firm has opened a new laboratory in Philadelphia which will allow for a concentration of research activities.

Heydon Chemical Corp., New York—A new sales office in Cincinnati, in the Paramount Bldg., will serve the Midwest area.

Benjamin Foster Co., Philadelphia—New general offices at the Philadelphia plant site. The project also provides for additional laboratory space for research and development of the company's line of adhesives and plastic coatings.

Bemis Bros. Bag Co., St. Louis—A manufacturing plant in Wilmington, Calif., will house office, factory and storage facilities for the production and distribution of its multiwall paper shipping sacks. In addition, the firm has acquired all the outstanding stock of the Flexible Package Co., Chicago. The latter firm will operate as a wholly owned subsidiary while it continues its activities in polyethylene bag production.

Cramet Inc., Chattanooga, Tenn.—New titanium plant to be built by Turner Construction Co., New York, under the supervision of the Vitro Corp. of America.

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or "Indianaite"
or "Halloysite"

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HIGH IN ALUMINUM CONTENT (as high as 39%)
LOW IN IRON OXIDE (1.1%)

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Good rail facilities for clay or finished products

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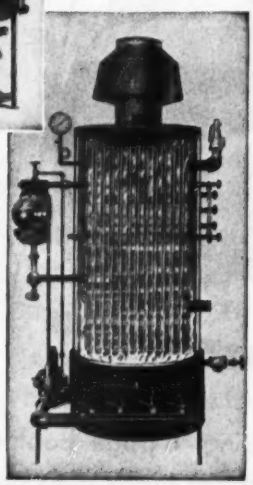
Here's a truly *"unitized"* steam supply—a compact, self-contained BOILER PACKAGE that is completely automatic . . . requires no attendant and only a bare minimum of floor space. The KANE BOILER PACKAGE includes: the correctly sized Automatic Gas-Fired Boiler complete with gas burner and controls to maintain required steam pressure; and an M-K-O Automatic Boiler Feed system designed to return condensate and supply make-up water as required for highest operating efficiency.



The M-K-O Automatic Boiler Feed returns condensate and supplies small quantities of hot water as needed to the KANE Boiler.

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Engineered Steam at its best with over 50 years of experience at your disposal—so, send your steam problem to us for study and recommendation.

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Volume IV in the Inorganic Syntheses Series. Gives methods of preparing inorganic compounds, with specific directions plus hints on general procedure, precautions, and laboratory equipment. Includes general articles on the preparation of anhydrous halides, fluorination of non-polar halides, and several syntheses involving phosphorous compounds. Each synthesis carefully checked in at least one independent laboratory. John C. Bailer, Jr., Univ. of Illinois, Ed.-in-Chief. 218 pp., 19 illus., $5.00.

UNIT PROCESSES in ORGANIC SYNTHESIS

Covers the principles and practices of reactions in organic synthesis, recording their development in terms of underlying unit processes. Deals with nitration, amination by reduction, halogenation, sulfonation, oxidation, hydrolysis, etc.—systematically discussing the factors and fundamental principles concerned in each. Fully revised to keep pace with chemical and chemical engineering advances, the book gives increased attention to developments in kinetics and thermodynamics. Some of the new material is based on actual German factory operations. Ed.-in-Chief, P. H. Groggins, Bu. of Agric. & Indus. Chem., U. S. Dept. of Agric., Washington, D. C. 4th Edition, 937 pp., over 200 illus. and tables, $12.50

Elements of FRACTIONAL DISTILLATION

A unified coverage of the fundamentals from the standpoint of physical chemistry, viewing the design methods for determining the number of theoretical plates in fractional distillation apparatus and the mechanical problems encountered in fractionating column design and performance. Covers vapor-liquid equilibria, and all types of distillation—successive distillation, fractional condensation, rectification, etc. Fourth Edition. By CLARK SHOVE ROBINSON and EDWIN RICHARD GILLILAND, Prof. of Chem. Eng., MIT. 492 pp., 175 illus. $7.50

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Written in the language of the mill, this book describes the machines that make the great variety of paper and paper board grades—shows the formation, lamination, finishing, and testing of the product. Includes new material on Fourdriniers, cylinder vats, wet presses, dryers, and both electrical and mechanical drives. Prepared by experts representing the Pulp and Paper industry of the U. S. and Canada. Edited by J. Newell Stephenson, 945 pp., 450 illus., $11.00

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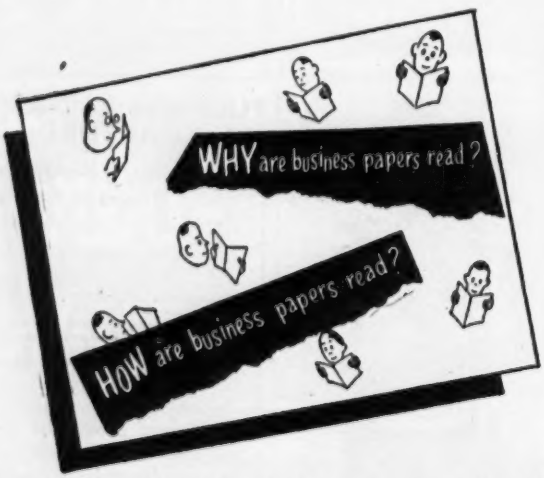

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FIRMS IN THE NEWS, *cont. . .*

The new construction will increase domestic production of titanium sponge by 6,000 tons annually.

Ansul Chemical Co., Marinette, Wis.—New office and warehouse in Kansas City, Mo., to serve as headquarters, in the Southwest, for the company's dry chemical fire equipment and industrial chemicals.

American-Marietta Co., Chicago—Has acquired controlling interest in the Universal Concrete Pipe Co., Columbus, Ohio. The firm thus becomes the largest manufacturer of concrete pipe.

Westinghouse Electric Corp.—A Raleigh, N. C., meter plant, now under construction, will make possible the expansion of production facilities of electrical instruments and relays now produced at the Meter Division headquarters plant in Newark.

Atlantic Research Corp., Alexandria, Va.—Additional office and laboratory space to meet recent expansion needs. The firm carries on research in the fields of chemical engineering, combustion, sonics, jet propulsion and high energy reactions.

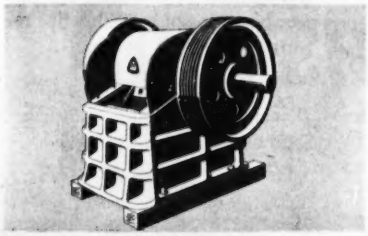
Chemical Products Co., Cartersville, Ga.—A new research laboratory and pilot plant for additional study in upgrading its line of products and in developing new ones.

Brea Chemicals, Inc.—Plans construction of a $750,000 dry ice plant in Orange County, Calif. The new plant will utilize the by-product carbon dioxide from the firm's ammonia facility nearby. The formation of a technical service division, to provide information on agricultural chemicals, has also been announced. In addition, the firm is planning to establish a sulfur producing plant at Rodeo, Calif.

Anderson-Prichard Oil Corp., Oklahoma City—Expansion proposals will result in higher yield of premium gasoline at the Cyril, Okla., refinery. To make this

DENVER EQUIPMENT

...NOTE THESE FEATURES...

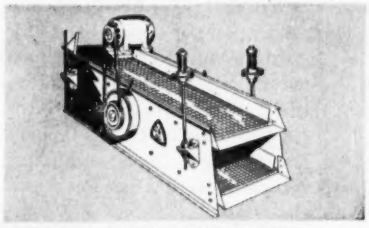


DENVER JAW CRUSHER

Size: 5" x 6" to 32" x 40".

Features: Steel Frame, anti-friction bearings, Manganese steel liners.

Price examples, less drives. FOB Denver.	5" x 6"	$ 581.00
	8" x 10"	1375.00
	10" x 16"	2211.00

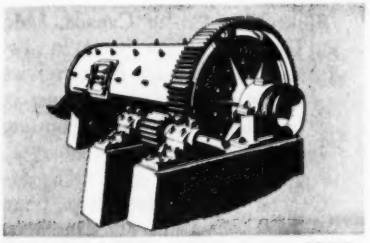


DENVER-DILLON VIBRATING SCREEN

Size: 1' x 3', to 6' x 14'; 1, 2, 3 or 4 decks.

Features: 2 bearing drive, low H.P., all steel construction.

Price examples, less drive and screen cloth, Double Deck. FOB Denver.	2' x 4'	$ 600.00
	3' x 6'	1155.00
	4' x 8'	1870.00



DENVER STEEL HEAD BALL MILL

Size: 30" x 18" to 6' x 24'.

Features: Cast steel heads, cut tooth gears, protected trunnion bearings and manganese steel liners.

Price examples, with liners, less drive and ball charge. FOB Denver.	30" x 36"	$1195.00
	4' x 4'	5156.00
	5' x 6'	7986.00

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Whether you're interested in one or many products, simply circle the desired items on the reply card and drop it in the mail. Prompt attention will be given your requests.

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To produce more ammonia without excessive expansion of existing facilities.

Solution

GIRDLER helped solve this problem by developing two highly active catalysts, G-19 and G-3. Without sacrificing quality or enlarging the gas plant, the use of these two GIRDLER Catalysts on synthesis gas production resulted in:

75% more output

Girdler specializes in solving catalyst problems. Its knowhow is at *your* service.

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Catalysts

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This smart business man spends his time where every sitzmark parks a prospect at his feet. He *specializes*. Your business is specialized, too . . . and so is your business paper. It's concentrated on *your* business. Both editorial and ad pages report what's new that's good . . . suggest new methods . . . gather in one place a raft of ideas on where-to-buy-what.

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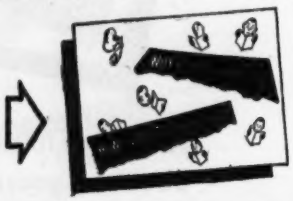

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McGRAW-HILL PUBLISHING COMPANY
330 W. 42nd St., New York 36, N. Y.

One of a series of ads prepared by
THE ASSOCIATED BUSINESS PUBLICATIONS

FIRMS IN THE NEWS, cont. . .

improvement possible, the firm has awarded a contract to the Blaw-Knox Co., Tulsa, for the construction of a catalytic reforming plant.

The Hammond Bag & Paper Co., Wellsburg, W. Va.—A new plant at Charlotte, N. C., has begun production of small bags for grain products and sewn open mouth bags for feeds and fertilizers. Plans to manufacture a complete line of multi-wall valve and open mouth paper shipping sacks are still in discussion stages.

Farm Bureau Service, Inc., Lansing, Mich.—A granulation plant at Kalamazoo, Mich., consisting of three major buildings, will have a yearly capacity estimated at 30,000 tons of granular fertilizer.

Binks Mfg. Co. of Canada, Ltd., Toronto—A new plant in Toronto will provide better service to the growing Canadian market for the firm's spray painting equipment.

General Petroleum Corp., San Francisco—A new office building, to serve as headquarters for the firm's northern California division, will be constructed early in 1954, in San Mateo, Calif.

Union Oil Co. of California—An addition for the firm's central territory headquarters in San Francisco. The $500,000 addition will double present space.

Enjay Co., Inc.—New regional office to open in Tulsa in recognition of the expanding importance of the Southwest to the petrochemicals industry. The new office located in the Wright Bldg. Annex will open January 1, 1954.

BRIDGEPORT BRASS COMPANY

CONDENSER AND HEAT EXCHANGER TUBE EDITION

COPPER ALLOY BULLETIN

Bridgeport Brass Co. MILLS IN BRIDGEPORT, CONN. AND INDIANAPOLIS, IND.—IN CANADA: NORANDA COPPER AND BRASS LIMITED, MONTREAL

Retubing condenser with special tools—Courtesy Condenser Service & Engineering Co., Inc., Hoboken, N.J.

Performance Surveys Increase Condenser Tube Life

Keeping careful and complete records of tube performance in each unit is good practice. The information obtained is valuable in many ways:

1. To determine the life cycle of a particular tube alloy so that retubing can be anticipated and shut-down time minimized.

2. To reveal the changes in the character of the circulating water and its effect on tube life.

3. To study changes in operating conditions with the objective of lengthening tube life.

4. To compare the behavior of different tube alloys under operating conditions as an aid to retubing with a longer-lasting alloy.

Improved Results Through Records

Many examples show surveys have led to lengthened tube life, improved heat transfer and greater tube efficiency. A plant operating its surface condensers on an intermittent basis for many years received satisfactory service from Admiralty. When it changed to a continuous basis and with a somewhat higher water velocity, Admiralty failed in two years as compared with six to twelve years previously. This plant changed to Aluminum Brass and now gets tube life comparable to Admiralty under intermittent service conditions.

In an oil refinery it was found that the product was considerably more corrosive toward copper-base alloys than toward steel due to the presence of large amounts of ammonia. However, the steel corroded rapidly on the water side. By changing to Duplex tube, consisting of steel to the product side and Red Brass to the water side, tube life was increased from four to five times.

Information Helps Find Key to Corrosion Attack

Corrosion, the greatest enemy of tube life, is most difficult to pin down since it is influenced by many variable conditions. Here information about operating procedures, composition of the water, steam, gas, product, temperatures, velocities, etc., plays a vital role in tracking down and correcting conditions that lead to corrosion and in finding the right alloy to withstand corrosive attacks.

Information on tube performance is especially valuable where failures are localized in some section of a condenser or heat exchanger, such as at the inlet end of the tubes, because a change in operating conditions or a better tube alloy is indicated. For example, excessive inlet end corrosion of Admiralty tubes can be reduced by changing to Aluminum Brass or Duronze IV (Aluminum Bronze). Where general corrosion (thinning) occurs along the entire length of the tubes, a change to a more corrosion-resistant alloy such as Aluminum Brass, Duronze IV, or Cupro Nickel may be indicated. The selection of the most suitable alloy can be determined from tests on sample tubes of different alloys.

Our Corrosion Laboratory is available for advising which alloy will give the longest service life for specific operating conditions.

Information concerning the performance of the tubing from data sheets should be sent along with the tube sample or samples. The tube alloy, character of circulating water and its temperature range, velocity, product handled, length of service, etc., are, of course, necessary in helping to diagnose tube failure.

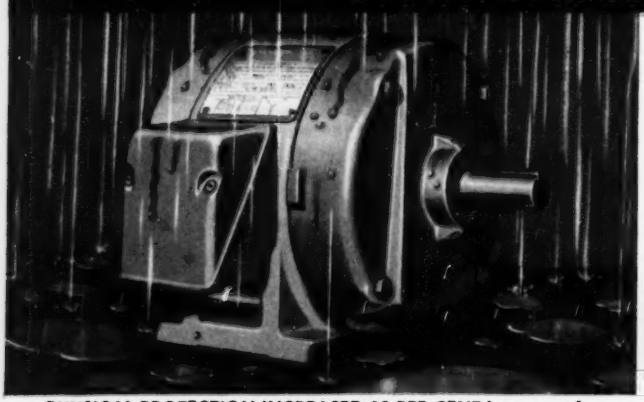
Proper Sampling

When submitting samples for Laboratory examination, it is important that a full length tube be submitted because a short piece may not be representative, since corrosion attack is generally not uniform throughout the tube. Consequently, the inlet end of the tube should be identified as well as the position of the tube and its location in the condenser or heat exchanger. A scratch line should be drawn on the outside of the tube along the top. When the tube is cut into shorter lengths for mailing, the pieces should be numbered progressively from the inlet end. We have listed specifically the information needed on pages 109 to 111 (Questionnaire on Tubes) of the Bridgeport Brass "Condenser and Heat Exchanger Tube Handbook."

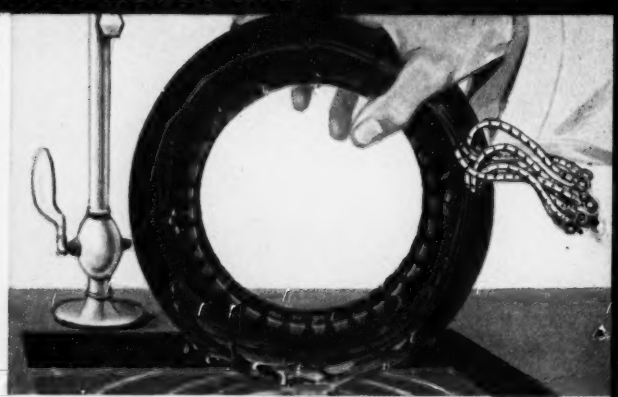
Technical Service Available

When considering retubing or when you have a tube corrosion problem, contact our nearest Sales Office. Write for your copy of the Bridgeport "Condenser and Heat Exchanger Tube Handbook" on Company stationery. (1173)

YOU GET EVEN LONGER MOTOR LIFE



PHYSICAL PROTECTION INCREASED 60 PER-CENT by a complete redesign of cast-iron frame and end shields. This motor is suitable for many jobs where ordinary dripproof motors should not be applied.



EXTRA ELECTRICAL STRENGTH is assured by use of new polyester film insulation. A silicone coating, Dri-film,* virtually eliminates stator insulation failure caused by moisture.

*REG. U.S. PAT. OFF.

TRI 55 CLAD THE LEADER IN MODERN MOTOR DESIGN

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GENERAL ELECTRIC ANNOUNCES...

THE ALL-NEW TRI 55 CLAD MOTOR

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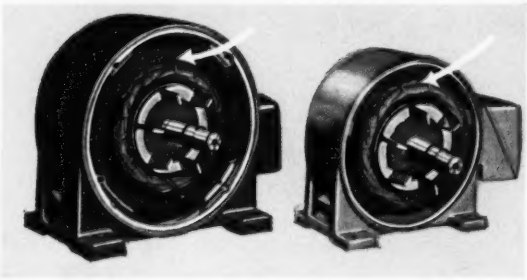


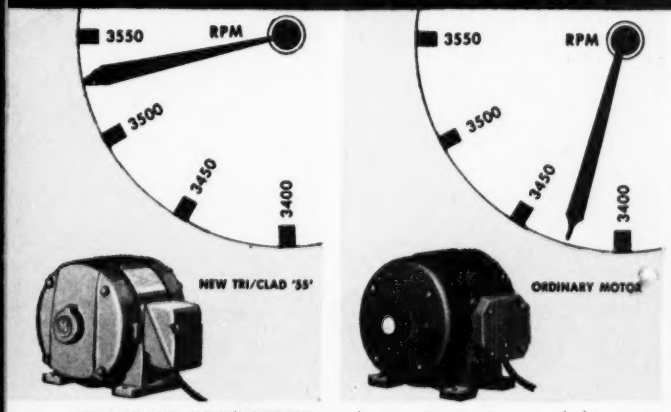
LIGHTER, SMALLER Tri/Clad '55' motors have been made possible through better use of space within the frame. Active materials (magnetic steel, copper) have not been sacrificed.

Complete Line of Dripproof, Enclosed Motors and Gear-Motors Available in Most Ratings in 1954

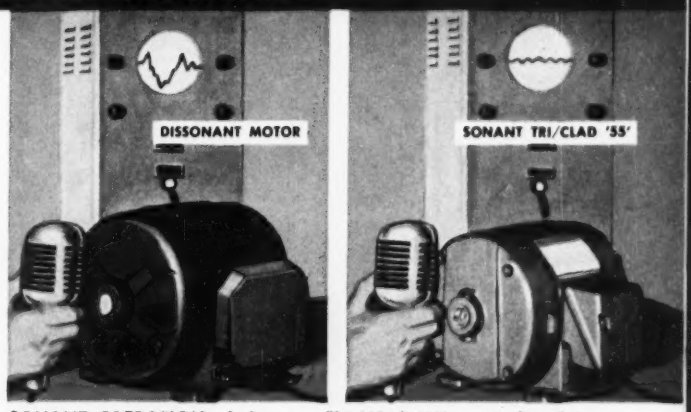
Here's the all-new Tri/Clad '55' motor — now available in NEMA 182 and 184 frame sizes.

You can get complete information on this dramatic motor achievement by writing for bulletin GEA-6013 on Tri/Clad '55' Dripproof motors, GEA-6012 on Tri/Clad '55' Enclosed motors, or GEA-6027 on Tri/Clad '55' Gear-motors, or by contacting your nearby G-E Apparatus Sales Office or G-E Motor Agent. General Electric Company, Section 648-1, Schenectady 5, N. Y.

YOU GET EVEN BETTER PERFORMANCE



HIGHER FULL-LOAD SPEEDS is only one of many improved characteristics of this new G.E. motor. Above shows comparison of an ordinary motor with the Tri/Clad '55' — both rated at 3600 rpm.



SONANT OPERATION of the new Tri/Clad '55' motor has been laboratory tested and proven. Motor operates at reduced noise level, and operating sound is pitched to a more pleasant frequency.

YOU GET EVEN MORE INSTALLATION AND MAINTENANCE SAVINGS

NEW BEARING SYSTEM allows this motor to run longer than other motors without regreasing. One reason—greatly improved synthesized grease with 8 times the mechanical stability of ordinary grease.

EASIER TO SERVICE, the new Tri/Clad '55' has larger conduit box diagonally split for simplified wiring. Perma-numbered leads mean that even clipped and stripped wires are instantly identified.

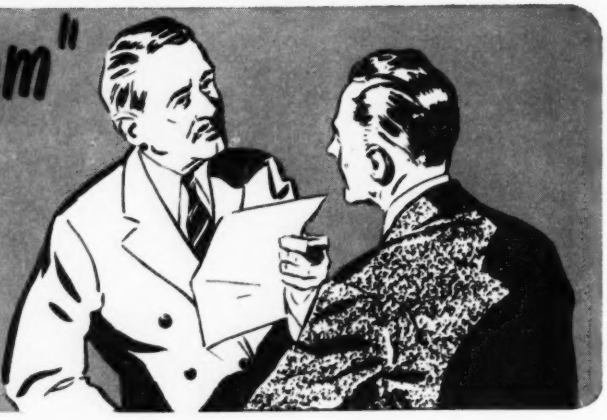
Progress is our most important product

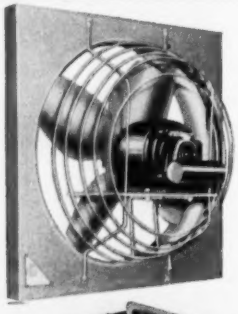
GENERAL ELECTRIC

"Here's My Problem"

CUSTOMER:

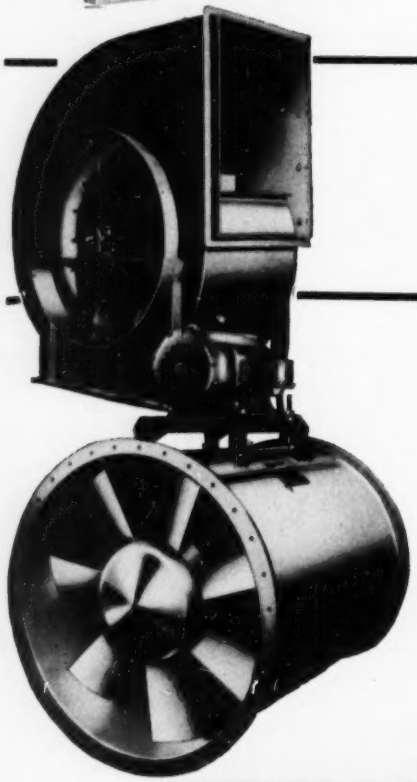
First, one of our older buildings has areas which need spot ventilation. Then, in another building, we're going to need large-capacity exhaust to get rid of dust and moisture. Finally, we need additional capacity in an old system where we've just installed some air cleaning equipment. Now, my problem is . . .





Which "Buffalo" Fan Shall I Use?

"BUFFALO" REPRESENTATIVE: "To begin with, no single type of fan is the best solution to *all* problems. The best and cheapest answer to your spot ventilation, for instance, is the new Type "NV" Breezo Fan. An efficient propeller fan with strong rigid, die-formed square panel, the "NV" is simple to install in outside walls wherever you need to exhaust stale air. It can be operated free-air or duct-connected (¼" to ½" s.p.) equally well. The "NV" is made in sizes for 500 to 5500, cfm capacities, and if you need larger capacity, use the new "NV" Heavy-Duty Belt-Air, it's in sizes up to 90,000 cfm.



"Now, for your large-capacity exhaust system, you'll get greatest long-run satisfaction and economy with the new Type "BL" Limit-Load centrifugal fan. It's the type recommended most frequently for large systems—straight ventilation, air washer and air conditioning supply. You can't overload it, and it gives stable performance from shut-off to free air delivery. And you can pick exactly the rated capacity you need, from 1000 to 500,000 cfm, with no waste in an oversize fan or over-specified driving power.

"But where you need to step up the capacity of a system, mount an axial flow fan in a straight portion of your ductwork. The "Buffalo" Axial Flow is light, compact and takes little more space than your duct. It's extremely efficient in straight runs, and has guide vanes to keep turbulence and noise at a minimum. So you see, there is no *one* fan for all jobs. At Buffalo, we make all types and sizes, so that you can pick one that's practically tailored to your particular need. We've been building fans for 77 years, too, which means that you can be sure of any "Buffalo" fans you pick."

SUGGESTION: and most important of all, remember that Buffalo Engineering Sales Representatives are all technical graduates, factory trained for a number of years; they know fans and their application. Located in all principal cities, they are ready to assist you, too, in fan selection. Why not call on yours today?

"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

501 BROADWAY BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

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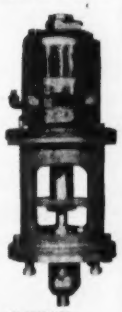

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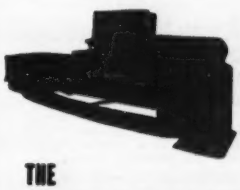

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Excellent opening with outstanding national corporation for Sales Engineer who is familiar with industrial cleaning problems and processes. Chemical or mechanical engineering degree desirable but not essential. The man selected will report directly to management and have a high degree of autonomy in finding applications for and developing and selling the use of ultrasonics for cleaning. All replies will be held in strict confidence. Please submit resume of qualifications and a recent snapshot (if available) to

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Graduate Mechanical, Chemical or Civil Engineer with natural mechanical ability and excellent practical and supervisory and some construction experience for charge, under chief engineer, of all shops, foundry, mobile equipment, including loading, marine, railway and construction; maintenance and repair of all types equipment; 3500 KVA diesel generating plant.

Age not over 45. Three year contract with three months' paid vacation at completion contract and two 1-week local leaves after first year. Furnished house and partial utilities supplied free. Free transportation self and family. Hospital, medical and elementary schooling free. Non contributory pension plan. Report single status six months. Require complete record, education, employment and references; also marital status. Photograph optional. Location—Mediterranean. Large copper mine. Salary open.

P-9800, Chemical Engineering
1111 Wilshire Blvd., Los Angeles 17, Calif.

In order to expand and diversify the editorial service rendered by CHEMICAL WEEK, the editor is seeking three men with these specific backgrounds:

(1) **Chemist or chemical engineer** with 3 to 10 years' experience in chemical production. He must be well versed in processing, process techniques, equipment.

(2) **Chemist or chemical engineer,** expert in commodity studies. Ideal experience: 3 to 5 years as a market researcher.

(3) **Chemist** with 3 to 5 years' experience in industrial research.

In addition to the foregoing, these men must (1) enjoy meeting people, (2) have the ability to dig out facts and interpret them intelligently, (3) be able to write lucidly.

Address your resume to:

Gerald B. Reynolds, Personnel Relations

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RESIN SALES. Could use one more good man. Full line UREA, Phenolic Resins—Liquid or Powder types. All correspondence treated in confidence. Synvar Corporation, Wilmington, Delaware. Address Reply to Sales Mgr. c/o P.O. Box 1768.

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SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 43 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 262 Dun Bldg., Buffalo 2, N. Y.

SALARIED PERSONNEL $3,000-$25,000. This confidential service, established 1927, is geared to needs of high grade men who seek a change of connection, under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. P. 241 Orange St., New Haven, Conn.

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SALES ENGINEERING Organization with wide experience and contacts, wishes to represent manufacturer of Heat Exchangers & Chemical Process Equipment on an exclusive basis in the New York, North, N. J. and S. W. Conn. territory. Also interested in other lines for the chemical and process industries. RA-9151, Chemical Engineering.

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For Large Copper Company, Chile, South America

Must be experienced in analytical work of all kinds, including complete analysis of ferrous and non-ferrous metals, etc. 3-year contract. Transportation both ways and salary while traveling paid by Company. In reply give complete details.

P-9021, Chemical Engineering
330 W 42 St., New York 36, N. Y.

WANTED
Design & Process Development Engineers

Design and process development engineers wanted to work on developing and improving glass manufacturing processes for a leading glass company located in Ohio. Openings for mechanical, chemical, ceramic, and electrical engineers. Duties will involve carrying new processes through development into manufacturing.

Salary commensurate with training and experience.

Reply should include resume of training and education and should state salary requirements.

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WANTED
Bio-Engineer & Production Manager

Permanent position available with national food company for Bio-engineer and Production Manager to design and take full charge of plant to make a new fermented biochemical for the pharmaceutical field. Location in midwest. Desire experienced man 32-42 with engineering background and successful record of practical management in biochemical production.

Please furnish complete resume of qualifications and initial salary requirements. Replies held in confidence.

P-9999, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

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EXPERIENCED PAINT CHEMIST

Old, well established, midwest company wants experienced man to head up group investigating and developing protective coatings with special emphasis on pigments. Experience in writing and presenting technical papers as well as wide acquaintance in paint industry helpful. Should be under 45 years of age with technical education. Salary commensurate with experience and professional background. Send detailed resume, in full confidence, with picture if available and copies of any papers presented to:

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Does This Fit You?

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If your answer is "Yes," tell us about yourself. We're looking for people like you to help us expand our editorial services. Replies will be treated confidentially.

Write (no phone calls, please) to:

W. Alec Jordan, *Editor*
CHEMICAL WEEK
330 W. 42nd St. New York 36, N. Y.

PLANT FOR SALE

Metropolitan Area. 65,000 sq. ft. Three story brick building. 2 oil-fired boilers over 700 B.H.P. each 160 lb. rating. Building sprinklered thruout with freight elevators, 185' loading dock, and 6,000 sq. ft. yard.

Unlimited soft water and city sewerage. Brick garage 10,000 sq. ft. sprinklered and heated. Easily accessible to various communities, highways and turnpike. Plant now operating with plentiful local labor.

BO-7883, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

Wanted Advertising—page 466

NEW LOCATION WHERE "CONSOLIDATED" CAN SERVE YOU BETTER IN 1954

CONSOLIDATED PRODUCTS CO. INC. has moved its executive offices from Park Row, New York City, and its shops and warehouses from Doremus Avenue, Newark, N. J. to its new Building at Observer Highway and Bloomfield Street, Hoboken, N. J.

CONDENSER SERVICE & ENGINEERING CO. INC. which has been acquired by Consolidated Products has moved its executive offices from River Street, Hoboken, N. J. and all its manufacturing and repair facilities to Observer Highway and Bloomfield Street, Hoboken, N. J.

BOTH THESE COMPANIES AND ALL THEIR FACILITIES ARE NOW UNDER ONE ROOF

This consolidation will make for wider scope in increased services with resulting lower costs and greater savings in time and money to its hundreds of satisfied clients.

SPECIAL PURCHASE

All Equipment Two Years Old

3—PFAUDLER GLASS LINED REACTION KETTLES: jacketed, 750, 500, 200 gal. Each with motor driven agitator.

6—MONEL Kettles, 6' dia. x 5', Jacketed, agitated, cone bottom, each with motor drive. Also 1—5' dia. x 6'9".

1—BAKER PERKINS "TER-MEER" CONTINUOUS CENTRIFUGAL, 12" basket, motor driven.

1—ALL MONEL ENZINGER FILTER: jacketed, 28" x 56", 8 monel leaves.

1—Carrier Corp. Refrigeration Equipment to provide 140,000 BTU hr. refrigeration; Freon 12 compressor.

1—Carrier Corp. Refrigeration Compressor, Size 5F-60, Freon 12.

1—5' dia. x 9' 6" Copper Vacuum Pan, cast iron jacket, also steam coils.

2—7' x 19' Horizontal Steel Welded Storage Tanks.

Including many Condensers, motor driven Pumps, etc.

WIRE, PHONE, WRITE FOR QUOTATIONS

SELECTED OFFERINGS

1—8' x 150' Vulcan Iron Works, Rotary Kiln, ¾" shell, 16" face tires; 14" face girth gear; 28" x 18" carrying rolls, firing hood, etc.

1—6'6" x 12' Rotary Granulator or Dryer

4—Mikro Pulverizers, 4TH, 2TH, Bantam SH.

1—Sturtevant 6" x 15" all Steel Jaw Crusher

1—Sharples C-20 Super D-Hydrator

2—Bird 36" x 50" continuous centrifugals, rubber covered

1—42" x 120" Buflovak atmospheric Double Drum Dryer; other smaller sizes.

3—3' x 50' Bonnot Rotary Dryers or Coolers

1—#12 Sweetland Filter

1—Shriver, iron, 42" x 42" PF Filter Press, 18 chambers, 1" cake

12—Sperry 18" x 18" Iron Filter Presses, 11 chambers

10—Pebble Mills, 6' x 8', 800 gal.; 5' x 4', 235 gal.; 125, 50, 25 gal.

4—Devine #28 Vacuum Shelf Dryers, each 20 shelves, 59" x 78"

WANTED—Your Idle Machines and Plants

CONSOLIDATED PRODUCTS CO., INC.

150 OBSERVER HIGHWAY & BLOOMFIELD ST. • HOBOKEN, N. J.

N. Y. TEL.—BArclay 7-0600 HOboken 3-4425-8

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MODERN REBUILT EQUIPMENT
Reduced For Quick Sale

UNION Rebuilt Machinery Established 1912

Elgin 24-Head Rotary Capper.

Horix. S.S. 14-Head Rotary Filler.

Resina LC and Capem 1SF automatic Cappers.

F.M.C. Kyler A adj. Wraparound Labeler.

Burt automatic Wraparound Labeler.

S. & S. G1 and HG88 Duplex Auger Fillers.

Colton 2, 3 RP Rotary Tablet Machines.

Triangle Elec-Tri-Pak G2C, A6CA Fillers.

Filler 4-Head and Hope 6-Head Stainless Steel Piston Fillers.

650 to 850 gal. Jacketed Mixing Tanks.

Standard Knapp 429 Carton Sealer.

Fitzpatrick Stainless Steel Model D Comminuter, 7½ HP.

Mikro 4TH, 3TH, 3W, 1SH and Bantam Pulverizers: Schutz O'Neill Mills.

3500 gal. working cap. Steam Jacketed, Double Arm Mixing Tanks for mixing, storing or processing of your materials.

Day 650 gal. Jumbo Steam Jacketed Mixer.

Koven 2000 gal. Spiral Jacketed Mixer.

Baker Perkins 150 gal. Unidor S. J. D. A. Mixer.

Stokes, Day New Era, Hottman Mixers, from 2 to 450 gal., with and without jackets, Single, Double Arm Agitators.

Baker Perkins and Readco heavy duty, 3 to 160 gals., Double Arm Jacketed Mixers with Sigma or Fish Tail Blades.

Robinson 20x48 Two Deck Sifter.

Tyler Hum-mer #27 Two Deck Sifter.

Day 100, 800, 1500, 10,000 lbs. Dry Powder Mixers and Sifters.

World and Ermold Rotary and Straight-away Labelers.

Oliver Sweetland #2, Sparkler, Stainless Steel, Alsop Filters.

Pneumatic Scale Cartoning Line.

Oliver cellophane adjustable Wrapper.

Hayssen Auto. Wrappers, all models.

Hudson Sharp Campbell 2W6 High-Speed Automatic Cellophane Wrapper.

Package Machy. FA2, FA4, FA Wrappers.

OVER 500 MACHINES IN STOCK—IMMEDIATE DELIVERIES

Further Details and Quotations Available on Request

Immediate Deliveries

UNION STANDARD EQUIPMENT CO.
318-322 Lafayette Street New York 12, N. Y.

QUICK DELIVERY ON GUARANTEED EQUIPMENT

DRYERS & KILNS

5' x 15' Rotary Kiln brick lined, complete.
Christie 7½' x 60' Oil Fired Rotary Dryer
8 & 8 3' x 15' Evendur Rotary Dryer.
2—Albright-Nell 4' x 9' Atmos. Drum Dryers.
Devine #12 Vac. Shelf Dryer, 40" x 42" shelves.
1—Buffalo Vac. Drum Dryer 24" x 26".
6—Steam, Gas & Electric Dryers, Tray & Truck.
New Seco Rotary Dryers & Kilns, good deliveries.

CENTRIFUGALS & CENTRIFUGES

4—Tolhurst 40" Suspended Type Centrifugals. Bottom Discharge. Motor Driven.
8—Centrifugals 12", 30", 40", 42" & 48" Steel, Copper, Stainless & Rubber Lined.
12—Sharples Centrifuges #5A Stainless. Also #8.
3—De Laval Multiple Clarifiers #200, 300 & 301.

FILTER

1—Vallez 41 Stainless Covered Leaf Filter, type 49.
10—Sperry & Shriver 12", 18", 18", 24", 30", 36", Iron & Wood Filter Presses, also disc type.
Sweetland & Oliver Rotary Vac. Filters.

KETTLES & TANKS

100 gal. Stainless Steel closed agit. Jack. Kettle.
1—Dopp 350 gal. Cl Jack. Vac. Kettle.
Devine 36" dia. Impreg. Unit, closed Jack-Liquor & Impreg. Kettles. Also 100 gal. size.
Devine 1000 gal. closed Jack. agit. steel kettle.
1—2300 gal. vert. agit. Jack Steel Kettle.
1200 gal. Agit. Steel Tank 15 HP. Expl. Pr. Motor.
600 gal. vert. agit. Jack. Steel Kettle.
8—Jacketed Kettles 50 to 2500 gals.
1—250 gal. Lead Lined Kettle.
2—Pfaudler 500 gal. vert. Glass Lined Tanks.
New Stainless Steel Tanks 50 to 10,000 gals.
50—Stainless Alum., Copper, Glass & Lead Lined Kettles & Tanks. Also new Stainless.
250 gal. vert. Copper Jack. Kettle.
8—Copper Varnish Kettles 150, 200 & 300 gals.

PULVERIZERS & MILLS

Patterson 30" x 42", 6' x 5', 6' x 8' Pebble Mills.
Abbe 24" x 33" & 30" x 36". Also Jar Mills.
#1 Raymond Automatic Pulverizer 20 H.P. motor.
1—Raymond #80 Pulverizer 30 H.P. Complete.
4—#0000 Raymond Mills.
1—Hammer Mills & Pulverizers 3 to 50 H.P.
1—Schutz-O'Neill 20" Pulverizer. Also #1.
1—Sturtevant 30" Rock Emery Mill.
1—Robinson 18" & 22" Attrition Mills.
1—Lehman 4 Roll W. C. 12 x 36" Steel Mill.
5—Steel 3 Roll Mills 8 x 22 to 16" x 40".
1—9" x 36" Double Steel Roller Mill.
1—9" x 24" 3 pr. high steel Roller Mills.
3—Hoschin 18x36", 4 Roll Granite Stone Mills.
Ball Jewell, Sprout Waldron Rotary Cutters.
2—U. S. & Premier 1½ H.P. Colloid Mills.

MIXERS & SCREENS

Baker Perkins double arm 100, 50 & 9 gals.
5—American Tool 300 gal. Churns.
Horiz. Mixers single & double arm to 200 gal.
3—Day & Ross Pony Mixers 15 & 40 gals.
1—Century 2 HP. 4 speed Vert. Mixer.
6—Lead & Paste Mixers 50 to 150 gals.
1—Tyler 3' x 5' Vibratory 2 Deck Screen.
Patterson 42" dia. Stainless Conical Blender.
1—Master Drum Type Blender 1000#.
10—Dry Spiral Mixers 50 to 3000#.
12—Portable Elec. Agitators ¼ to 2 H.P.

MISC. & SPECIAL

Stokes #200, 4" dia. Preform Machine.
Stokes E Tablet Machine ½".
B & J & Abbe #000 & #1 Rotary Cutters.
Anderson RB Expeller 20 HP Motor—Driven.
Sly Dust Collector, Bag Type, 242 sq. ft., complete.
150 gal. Post or Change Can Mixer.
Gould 75 HP Centrifugal Pump, 250 PSI.
2—6" x 12" Lab. 2 Roll Mills. Also Calenders.
4—Farrell 2 Roll, Rubber & Plastic Mills.
3—Rubber & Plastic Extruders 1' to 6".
1—Stokes 2E Paste Filler up to 5 gal.
1—Marco #200 Stainless Steel Homogenizer.
1—Stokes & Smith & Day Powder Fillers.
6—Filling Machines. Liquid Paste & Powder.
Rotary & Single Punch Tablet Machines, ¼" to 4".
1—Howe Mogul Barrel Bag Picker.
2—Worthington 12" x 12" x 12" Vac. Pumps.
6—Devine Stokes & Buffalo Vac. Pumps.
Soap Machinery for Toilet Laundry Chip Liquid.
Plastic & Rubber Hydr. Presses, Extruders & Injection Molding Equipment.
Roller & Screw Conveyors, Portable Elevators.
Revolving Pans, Boilers—Gas, Oil & Coal.

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A RENTAL COMPRESSOR FOR EVERY JOB

55 CFM Lindsay (GAS) Portable
60 CFM Worthington (GAS) Portable
70 CFM Smith (GAS) Portable
89 CFM 6 x 7 Worthington HP, 15 HP Elec.
105 CFM Worth-IR-CPT Portable
107 CFM 7-7 x 7 Ingersoll ES-1 STEAM
129 CFM 7½ x 7 American AF1, 20 HP
142 CFM Ingersoll Semi-Portable 25 HP
160 CFM IR-Worth—Portable
165 CFM Smith 1105R Semi-Portable, 25 HP
195 CFM 8-9 x 9 Worthington HS STEAM
210 CFM Worthington (GAS or DIESEL) Port
211 CFM 9 x 9 Worthington HB, 40 HP Elec.
279 CFM 11-10 x 11 Worthington HS STEAM
294 CFM 10 x 12 Worthington HB, 50 HP
315 CFM Worthington (GAS or DIESEL) Port
387 CFM Gardner Semi-Portable 75 HP
445 CFM Gardner Semi-Portable 100 HP
462 CFM 12-14½ x 13 American AF-S STEAM
500 CFM Worthington (DIESEL) Portable
538 CFM Worthington Semi-Portable, 100 HP
600 CFM Worthington (DIESEL) Portable
628 CFM 14 x 13 Ingersoll ES-1, 100 HP

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NORTH BERGEN, N. J.
Telephone UNion 5-4848

FOR SALE—WE OWN IT OR CONTROL IT!

COLUMNS—STILLS

1—Bubble Cap Column, High Chrome Iron, 64" dia. x 13 plates.

3—Baffle Plate or Cascade Columns or Towers, T304 stainless steel, 5' dia. x 50' high.

2—Sections 6' dia. St. St. Baffle Plate Column.

3—Aluminum Bubble Cap Columns, 36" dia. x 45 plate; 27" dia. x 18 plate

1—Aluminum Perforated Plate Column, 28" dia. x 36 plate.

1—Copper Column with 18—30" dia. perforated plates and 10—24" dia. bubble cap plates.

CONDENSERS—EXCHANGERS

1—St. St. Single Pipe Cooler, 2" pipe, 800 ft.

3—St. St. Double Pipe Coolers—73 & 78 sq. ft.

15—Alum. Coil Exch. 47 sq. ft.

7—Copper tub. 65, 90, 140, 1350 sq. ft.

6—S.S. Tubular Exchangers 14, 55, 70, 160 & 400 sq. ft.

1—Steel Shell & Tube, 1000 sq. ft.

3—S.S. Coil Condensers, 40 & 55 sq. ft.

FILTERS

3—Adams T304 St. St. Single Tube, #WJR-1.

2—International T304 St. St., #3 (24" dia.) and #5 (33" dia.)

1—Sweetland #10, 21 leaves, 3½".

1—Sweetland #12, 72 leaves, 2".

1—Swenson Rotary Continuous Vacuum Filter; Precoat type, 8' dia. x 8' face, rubber covered and lead acid proof.

1—FEINC Aluminum Rotary Vacuum string discharge, 4'6" dia. x 6'.

4—Pressure Leaf Filters, 70 to 140 sq. ft.

1—Shriver 36" Filter Press, rubber covered, closed delivery.

1—Shriver 36" C. I. P&F., 20 ch. cl. dly.

1—Sperry 24" C. I. Filter Press, 16 Ch.

1—Louisville 8-roll Continuous Filter or Grains Press, 24".

JUST PURCHASED

8—4100 gal. Aluminum Tanks, Vert., closed, 5/16"

24—Lastiglas lined welded steel tanks 13,700, 9100, 6000 and 4400 gal. sizes.

1—Kennedy Van Saun Continuous Air Swept Ball Tube Mills, 3' dia. x 6' long, steel liner, steel balls.

15—Aluminum Compartment Tanks, 2700 gal. & 3000 gal., 5 comp., removed from truck chassis.

1—48" dia. Bubble Cap Column, 40 plates on 12" centers (12 T347 St. St. plates, 12 copper plates, 16 steel plates).

KETTLES—REACTORS

8—15,000 gal. Steel Reactors, with coils and 40 HP agitator.

1—450 gal. Monel Tank, ¼", with coils.

3—13 gal. Autoclaves, T347 St. St., 700# int. WP., 50# Pkt. WP.

1—St. St. T304 Pressure vessel, 18" dia. x 9'4" long, 600# W.P.

2—450 gal. Stainless Steel Kettles, Jktd. & Agit.

70—Stainless Steel and Stainless Clad open top, steam jacketed kettles—40, 60, 80, 100, 150, 500 gal. sizes.

2—300 gal. T316 Stainless Steel Jacketed Tanks, 10# jkt. double motion agit.

1—200 gal. Read Stainless Steel Jacketed Kettle, double motion agit., 10 HP.

4—Aluminum Reaction Kettles, Jktd. & Agit., 35, 60, 100 gal. and 250 gal.

MILLS—PULVERIZERS

1—Kennedy Van Saun 3' x 6' Air Swept Contin. Ball Tube Mills.

1—Williams Hammer Mill type AK; size A, stainless steel.

4—Mikro Pulverizers, #1-SH, #1-SI #2-SI, #2-TH.

1—Premier Colloid Mill, 6" st. st.

1—Acme #8½A Jaw Crusher.

TANKS

35—Aluminum Tanks, closed, 4, 275, 330, 480, 500, 1350, 1450, 2300, 2700, 3000, 4100 and 9000 gal.

50—Horizontal Welded Steel Tanks from 3800 gal. to 21,700 gal. sizes.

1—Vertical Rubber Lined, 6000 gal. open.

8—15,000 gal. Vertical Welded Steel Closed Fermenting Tanks, 90 lbs. WP., turbine agitator with 40 HP motor; 970 lin. ft. 3" pipe coil. Excellent condition.

STAINLESS STEEL TANKS

3—T347 Pr. or Vac.—50 & 235 gal.

2—T316 Pr. or Vac.—35 & 160 gal.

11—T304 Pr. or Vac.—2½, 9, 150, 160 & 260 gal.

1—T304 600# pr.—86 gal.

50—Stainless Steel Storage Tanks—from 15 gal. to 8200 gal. sizes.

1—3000 gal. Horizontal Stainless Steel Tank, 5'4" dia. x 18'9" long, insulated and agitated.

MISCELLANEOUS

1—St. St. Bin, T316, 275 cu. ft. cap.

1—AT & M Susp. 48" Centrifugal, Perf. Basket, Bottom discharge, T-304 s.s.

1—Bird Susp. Centrifugal, 48" dia. Perforated Basket, T347 St. St.

5—DeLaval Centrifuges, models #600, 74-11 and 94-01.

1—B & J #1½ Rotary Cutter, St. St.

3—Witteman Co. Atmospheric Double Drum Dryers, 22" x 38".

2—Kux Machine Co. Model 25 Rotary Pellet Presses, 21 and 25 punch.

4—Selectro Vibrating Screens, stainless steel, 2' x 7', double deck, enclosed.

1—Stokes Vertical Steel Jacketed Vacuum Chamber and Impregnating tank, 30" L x 25" W x 24" D.

2—Vertical Agitators—40 HP gearmotor with Turbo #5B drive, 70 RPM.

1—Baker-Perkins #14—JEM Universal Mixer, Jacketed, Vacuum Cover, 50 gal. work. cap., 50 HP motor.

1—Porter heavy duty jacketed double worm mixer—75 gal.

140—St. St. Flanged Gate Valves, 1", 1½", 2", 2½" x 3".

HEADQUARTERS FOR STAINLESS STEEL EQUIPMENT

1—**USED EQUIPMENT IN STOCK** — TANKS — KETTLES — RECEIVERS — COLUMNS — STILLS — AGITATORS & MIXERS — CONDENSERS — HEAT EXCHANGERS — COILS — TUBING, PIPING, FITTINGS, ETC.

2—**CONVERTING OR CHANGING EXISTING EQUIPMENT** (Your own equipment or our stock)—can be done in our own shops utilizing good used or surplus new materials.

3—**FABRICATION—(IN OUR OWN SHOP)** Specializing in lighter weight tanks (1/4", 3/16", 10 ga., 12 ga., 14 ga., 16 ga., etc.) Heliarc welding. Water-quenched stabilized welds (if specified). Large stock of type 304 and type 316 sheets carried in stock assuring quick delivery of tanks built to your specifications.

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PERRY EQUIPMENT CORP.

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CABLE—PERI

WHAT DID INVENTORY REVEAL IN YOUR EQUIPMENT NEEDS OR SURPLUS? EITHER WAY FMC CAN SERVE YOU!

FMC will trade for your idle machines, buy your surplus units; sell or rent you pilot plant or large production equipment. Get set for a productive 1954.

14 Patterson and International Pebble Mills; 6' x 5'; 6' x 8' and 8' x 8'.

16 W & P. Type Jacketed Heavy Duty Double Arm Mixers; 100 gal. and 150 gal. working Caps.

6 Sperry Aluminum Filter Press; 18", 30" and 36" in excellent condition.

17 New and Unused Stainless Steel Tanks with agitators; 1000 gal. and 2000 gal. at great reductions below today's market prices.

20 Hammer Mills by Mikro, Gruendler, Fitzpatrick, Williams, Jeffrey, Sturtevant, Robinson, etc.

Bird Stainless Continuous Centrifuge, 18" x 28".

Mojonnier Stainless Vacuum Pan, 3' x 10'.

Charlotte No. 50 Monel Jacketed Colloid Mill.

1 Tolhurst Stainless 40" Suspended Type Centrifugal Extractor; 2 speed motor.

2 Stainless Processing Kettles, 6' dia. x 5'10½" deep plus cone bottom 2'4¾"; with agitators all in Stainless.

3 Steel Horizontal Tanks; 8' x 30" with ½" Steel bumped heads; with coils and saddles.

1 Niagara Stainless Pressure Filter; Model 110-20.

1 Oliver Pre-Coat Vacuum Filter lined with Type 316 Stainless; 5'3" x 10' plus all accessories.

1 Comb. Eng. Vertical Boiler; 323 BHP complete.

3709 V 1—Lancaster Rotary Digester or Reactor; stainless lined; 1,000 gal. 64" x 19'; Jacketed 300 PSI.

3781—Sprout Waldron Stainless Continuous Cylindrical Mixer; 28" diameter x 12' long with heavy ribbons.

T 6-800—16 A.O. Smith Glass Lined Horizontal Tanks; 7'4"x28' long and 34'9" long.

3659 R 3—Aluminum Bubble Cap Column; 27½"x36'; 11 sections; 60 plates.

3470—Stainless Bubble Cap Column, 8⅛" x19' high; 16 sections, complete.

3274—Swenson Quadruple Effect Long Tube Vertical Film Type Evaporator may be separated for single or multiple use; print available.

10595—Louisville Rotary Steam Tube Dryer Type "F" 54"x40' long with 38"x20' Cooler.

8316—Bagley & Sewell Double Drum Dryer; 28"x60".

655 R 6—General American Twin Drum Dryer, 42"x120" complete.

3501/E3—Devine Vacuum Chamber Dryer No. 12; accommodates 20 shelves, 40" x 43".

3853 S3—Baker Perkins Ter-Meer Type Continuous Centrifuge Size S12 in Type 316 Stainless, complete with Slurry Feeder.

3705 L7—Stainless Lab. Autoclave; 5" x 12" agitated.

3862 D28-31—Two Stainless Jacketed Reactors 18" x 18".

3549—Stainless Jacketed Autoclave 10" x 15" 3000 PSI; with anchor agitator.

3824 S 12—Pfaudler Glass Lined Reactor; Jacketed 12" x 12" with anchor agitator.

3424 K 11—Type 316 Stainless Closed Head Receiver; 38" x 42".

Shriver and Sperry Cast Iron Filter Presses from 12"x12" to 42"x42" of various types for every purpose.

Double Ribbon horizontal Mixers from 200 lb. to 5000 lb.; also tumbling Batch Mixers for amalgamating in all sizes.

FRED R. FIRSTENBERG, Pres.

FIRST MACHINERY CORP.

157 HUDSON ST. WOrth 6-3456 NEW YORK 13, N. Y.

IMMEDIATE SHIPMENT

AUTOCLAVES—2000 gal., 75 gal.

BARATTE XANTHATE—100 gal.

BLENDERS—730, 310, 157, 2.7 cu. ft.

CENTRIFUGES—Steel, 26", 30", 40".

CENTRIGUES—Sharples Nozljector DH2, SS, and Super D-Canter PY14, SS.

CENTRIFUGES—SS 40", 48".

CONVEYOR—Coal drag 49'8" cc.

CONVEYORS—Screw & Troughing Belt.

CRUSHER—Sturtevant 8"x5" roll.

DRYERS—Rotary, Vacuum, 30"x8' 5'x30', 7'x20' (2).

DRYERS—Double Drum, 32"x90", 36"x84", 48"x108", 42"x120".

DRYER—Single Drum, 5'x6'.

DRYERS—Conveyor, 2'x28', 6'x40', 6'6"x43', 8'x94', SS 16'x85'.

ELEVATORS—Bucket, 71', 64', 50', 44', 31', 27', 19' centers.

FILTERS—Rotary, Vacuum, 11'6"x18", 11'6"x14', 8'x14', 8'x12', 8'x10', 3'x4'.

FILTER PRESSES—42", 36", 30".

HYDRATORS—Clyde (2).

KETTLES & REACTORS—Stainless Steel, 3000 gal., 525 gal., 300 gal.

KETTLES & REACTORS—Steel, 2800 gal., 1700 gal., 1000 gal.

KILNS—3'x25', 4'x30', 5'x30', 5'x67', 7'x60', 7'x160', 8'x125', 9'x80'.

MILLS—5-roll 50" Raymond, 10"x48" Ball, 6'x8' Ball, 36"x42" Pebble, #1 Raymond Imp, Raymond #402 Bowl.

SCREENS—4'x10' Seco double deck, 4'x7' & 4'x10' Tyler-Hummer single deck.

TANKS—1200 gal., 4000 gal., 6500 gal., 8500 gal., 12,000 gal., 13,500 gal., 15,000 gal., 135,000 gal.

TANKS—Aluminum, 6000 gal.

TANKS—Stainless Steel, 650 gal., 9800 gal., 10,000 gal.

TANK—Lead, 525 gal.

TANKS—Pressure, 1300 gal., 250 PSI, 8200 gal., 390 PSI, 9000 gal., 50 PSI, 15,000 gal., 500 PSI, 23,000 gal., 600 PSI.

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STORAGE TANKS

—Prompt Shipment—

GLASS LINED TANKS — USED — 3000 gallon capacity. Welded construction—Fully insulated. Equipped with manhead. Suitable for milk, food products, lily white chemicals, solvents and fine lacquers.

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CRUSHERS, JAW—2x6, 9x15, 11x26.
HAMMER MILLS—Wms. Reg. #1, GA 30, Jeffrey 24x36, 36x36.
FEEDER—3'x9' pan with motor.
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2—Vulcan 8'x125', ⅜" shell.
2—Allis Chalmers, 9'x80', ⅜" shell.
1—Ruggles Cole 5'x30' Rotary Dryer.
7—Rotary Dryers 7'x60', 5'x67', 5'x40', 4'6"x50', 4½'x30', 4'x30', 4'x20'.
5—Link Belt, Hersey Rotary Dryers 2'7"x8', 3'x24', 3'10"x16', stainless and steel.
2—Hersey 6'x23', 5'x23' Rotary Dryers.
4—Louisville steam tube Dryers 6'x50', 6'x30', 5'x28', 3'x20'.
1—Buflovak single door vacuum shelf Dryer having 20—42"x42" shelves.
4—Devine single door Vacuum Shelf Dryers having 20, 14, 6 and 4—40"x43" shelves.
3—Stokes and Buflovak Rotary Vacuum Dryers 30"x8', 3'x15', 5'x30'.
1—Single Drum 4'x9' Flaker.
4—Buflovak double drum 48"x108", 42"x90", 36"x84", 32"x52".
1—Buflovak 32"x52" double drum 316 SS.
2—Buflovak 6' dia. Crystallizers.

FILTERS

1—Oliver 1'x1' Rotary-Vac Filter 316SS.
2—Oliver Monel 8'x10' Rotary-Vacs.
1—Oliver SS 8'x10' Rotary-Vac.
1—Eimco 4'x5' Rotary-Vacs complete with pumps, drives, piping, etc.
3—Oliver 5'3"x3' Rotary Vacuum Enclosed Precoat.
8—Oliver Rotary Vacuum 11'6"x18', 11'6"x14', 8'x12', 8'x10', 8'x8', 8'x6', 3'x1'.
1—Feinc steel 8'x12' Rotary-Vac.
2—Sweetland #12 with 72 and 36 leaves.
1—Sweetland #10 with 18 leaves
1—Sweetland #7 with 27 leaves.
1—Industrial Filter 304 sq. ft. rubber-lined, 18 SS leaves.
3—Vallez 500 sq. ft, Rotary Pressure.
1—Sperry 36" Recessed, 48 chambers.
1—Shriver 36" P&F 42 chambers.
8—Sperry 24" P&F, 16 chambers.
1—Shriver 24" Recessed, 30 chambers.
3—Shriver 18" Recessed, 30 chambers.
2—Sperry Aluminum 30" and 24" P&F.
10—Shriver, Sperry Filter Press Skeletons 42", 36", 30", 24", 18".

CENTRIFUGALS

1—Bird 40" suspended, Stainless Steel.
1—Fletcher 40" Suspended, Stainless Steel.
2—Bird 40" Suspended, rubber covered.
1—Tolhurst 32" Suspended, rubber covered.
1—Fletcher 30" Suspended, steel.
1—Tolhurst 26" Suspended, steel.
1—Bird 36"x50" solid bowl, stainless.
4—Bird 36"x72", 36"x50", 24"x38", 18"x28" solid bowl, continuous.
2—Sharples #16P Monel and SS Super Centrifuges.

PULVERIZERS—CRUSHERS

4—Hardinge Mills 4½'x16", 5'x22', 5'x36", 6'x22".
1—Bauer 36' Attrition Mill 2-50 HP mtrs.
6—Patterson 6'x8', 5'x6', 4'x5', 2½'x3½' brick-lined Pebble Mills.
5—Abbe 3'x4', 3'x3½' Pebble Mills.
2—Premier Colloid Mills 8" dia., SS.
1—Eppenbach QV-8 Colloid Mill 2 HP motor.
1—Jeffrey 30"x24" Hammer Mill, Type B.
1—Rodgers, 10"x16" Jaw Crusher.

SPECIALS

1—Link Belt 705-20 Roto-Louvre Dryer, 316 S.S.
2—Pfaudler 1000 gal. glass lined jacketed agitated Reactors. NEW.
2—American 42" x 120" Double Drum Dryers.
1—Raymond 5 Roll High Side Mill.
1—Bird 40" Suspended Centrifugal, bottom discharge, Type 347 S.S.
1—#2TH Mikro Pulverizer, S.S.
1—Buflovak 32" x 52" Double Drum Dryer, 316 S.S.
1—Patterson 500 gal. Steel jacketed agitated Reactor.
1—Baker Perkins #14JEM Vacuum Mixer, Sigma Blades, 50 HP motor.
1—Patterson 40" x 84" Gyratory Sifter, single deck S.S.
1—Sharples C-27 Super-D-Hydrator S.S.
1—Komarak-Greaves Briquette Machine, 3 tons per hour.
1—Devine 2' x 4' Vacuum Drum Dryer, 316 S.S.
1—2800 gal. Horizontal Tank with coils, 316 S.S.

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2—Mikro #1SI, #1SH and #2TH SS.
2—Sturtevant 5"x8" Roll Crushers.

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1—Patterson single deck 40"x96" SS.
5—Stainless single deck 40"x84".
3—#42 Rotex double deck 40"x84".
2—#12 Rotex double deck 20"x48".
5—Tyler Hummer 3'x5' triple deck.
4—Tyler Hummer 4'x15', 4'x10', 3'x10', 3'x5', single deck with V-16 Vibrators.
1—Abbe #2 Blutergess Sifter.
100'—12" Stainless Steel Screw Conveyor.
8—Bucket Elevators, steel housing 34' to 60' centers, 8"x5", 10"x6" buckets.

MIXERS

3—Baker Perkins 50 and 100 gal. Sigma Blades, jcktd.
2—Baker Perkins, Day, 35 and 50 gal. SS jcktd.
1—Patterson 4' dia. Conical, steel.
1—Robinson 4000# steel powder.
6—Rodgers 400 to 3000# powder.
8—New Portable Agitators ¼ to 5 HP.
4—Day, Ross 8 and 50 gal. Pony.

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5—Pfaudler Reactors glass-lined 2000, 1500, 1000, 750, 500 gal.
6—Buflovak, Zaremba and Kilby Evaporators 300 to 14,000 sq. ft.
1—Lummus 4' dia. Steel Bubble Cap Column.
1—4' dia. Bubble Cap Column, copper and stainless.
8—Heat Exchangers, SS 50 to 570 sq. ft.
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1—2800 gal. 316 SS Tank with coils.
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MISCELLANEOUS

7—Stokes Vacuum Pumps 10 to 100 CFM.
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2—5½'x7 & 60' Rotary Kilns.
1—6'x35' Louisville steam tube.
1—Davenport #3A bronze rotary Press.

Centrifugals and Clarifiers

1—32" Tolhurst suspended rubber perf. basket.
1—48" Tolhurst susp. steel perf.
1—40" Tolhurst suspended rubber covered perforate basket.
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3—Sharples airtight clarifiers, stain. steel.

Evaporators and Vacuum Pans

1—60 sq. ft. 316 SS Single Effect.
1—Alberger 1500 sq. ft. SS Condenser.
1—Peebles triple effect, stain. steel.
1—20 gal. Stokes st. steel Vacuum Pan.
1—Swenson sql. eff. Evap. 120 sq. ft.
1—Swenson quad. eff. Evap., 350 sq. ft.
1—Zaremba trip. eff. Evap. 150 sq.ft.
1—Swenson trip. eff. Evap., 850 sq.ft.

Filtration Equipment

1—Oliver Filter 1x1', 316 stain. steel.
12—Cast Iron recessed and plate and frame Filter Presses, 7" to 36".
1—Aluminum 30" 40-chamber P&F. press.
1—Lead 24" 38-chamber P&F. press.
1—Oliver 8x14' Filter.
1—Oliver pressure, iron, 110 sq.ft.
5—Alsop, Lomax internal pressure Filters, stain. steel and bronze.

MILLS

1—Hardinge 36" x 5' continuous Pebble Mill.
1—Jeffrey 35 hp. Hammer Mill.
1—Williams 518 No-Nife Hog.
1—Williams type AX 40 hp. Hammer Mill.
3—Mikro Pulverizers: #18H, 18I.
1—Attrition, Sprout-Waldron 20".
12—Pebble and Jar Mills, 1 to 235 gal.
5—Colloid Mills and Homogenizers.
1—Raymond 5-roll high side.
10—Hammer Mills, ¾ to 50 hp.
6—3-roll Mills, Day, 12x32" and 16x40".

MIXERS

1—Day #6 single arm, stain. steel.
2—50 gal. s.s. Kettles, dbl. act. agitators.
1—Day 1 bbl. stain. steel, single arm, jacketed, vacuum cover 3 hp.
2—Day Pony Mixers, 40 and 15 gal.
1—Abbe Lenart 5 and 110 gal.
1—Colton #6 s.s. Granulating.
1—Readco 250 gal. work. cap. stain. steel dbl. arm, 50 hp.
7—Baker-Perkins, Read, Lynn-Superior double arm, up to 100 gallons.
10—Day, Robinson Powder type, 50 to 2000#.

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30—Stainless Steel (some with agitators). new and used, up to 10,000 gal.
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1—B.P. 20 Gal. D.A. Jack. Mixer.
1—Micro 2TH Pulv. 15 H.P.
1—Simpson #2 Intensive Mixer.
1—Komarek Greaves Briquette Machine.
1—Raymond #47 Imp. Mill 50 H.P.
1—S.S. Condenser 370 sq. ft.
1—Bird 48" Sus. Style Extractor.
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1—Day 10 Gal. Vac. Mixer Pack, D.A.
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Abbe Lenart Mixer—110 gallon capacity. S/S Jacketed w/motor.
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3—9" Premier Colloid Mills, watercooled.
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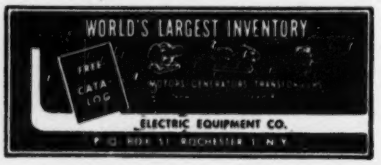

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2—Sweetland #12 filters, hydraulic close
3—Tolhurst 40" & 26" s/s susp. centrifuges
1—Buflovak 3 effect monel evaporator, 450 sq. ft.
1—Stokes 650 gal stainless vac pan or reactor
3—750 gal stainless 316 agtd & coiled reactors
2—250 gal Blaw Knox jktd & agtd ASME steel reactors 100#
1—2200 gal stainless clad jktd kettle
3—Baker Perkins 500 & 100 gal jktd double arm mixers
1—Paterson 8' conical blender, 25 HP explosion-proof motor.
1—Ross 92" heavy duty putty chaser, 20 HP geared motor.
5—Stainless steel 3' x 8' & 2' x 8' Niagara sifters
4—Devine & Buflovak vac shelf dryers, 20, 17, & 13 shelves
2—Buflovak 24" x 36" & 32" x 52" double drum dryers

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MAKE	SIZE	TYPE	Max. Press.	Max. Cap.
Connersville	8 x 20	RS	1½	600
Roots-Con.	36	AF	2	70
Roots-Con	3	NS	2	76
Connersville	20 x 60	SF	2½	6040
Sutorbilt	2520	SD	3	16
Roots-Con	22	XA	3	16
Sutorbilt	3L	SD	3	69
Roots-Con	47	AF	3	124
Roots-Con	59	AF	3	200
Roots-Con	615	AF	3	366
Roots-Con	717	AF	3	650
Connersville	10 x 15	SD	3½	890
Connersville	8 x 15	B	4	530
Roots-Con	17B	XSB	5	40
Roots-Con	55	XAS	5	96
Sutorbilt	3L	SD	6	31
Sutorbilt	4M	SD	6	76
Sutorbilt	5M	SD	6	115
Roots-Con	22 x 36	HD	6	5500
Roots-Con	53	AF	7	70
Connersville	10 x 12	HD	7	614
Sutorbilt	5H	XB	10	66
Sutorbilt	6H	XB	10	128
Roots-Con	8 x 6	HD	10	215
Sutorbilt	10 x 11	HD	10	480

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TURBO BLOWERS

MAKE	SIZE	H.P.	Volume c.f.m.	Static-oz.
Buffalo	4E	½	450	
Max-Premix	1	½	95	1.69
Max-Premix	5	¼	200	2.3
N. American	3	1	34	3.50
Spencer	Belt drive		35	7.32
Spencer	50½	½	60	8
N. American	308-B1-½	½	100	8
Gen. Blower	890-¾	¾	180	8
West. Prod.	1	1	300	8
N. American	308-D12	2	575	8
N. American	308-D13	3	850	8
Eclipse Fuel	6818-½	7½	1100	9
Sturtevant	No. 2	1	215	10
Fisher Furn.	F-15	1	300	10
Fisher Furn.	F-20	2	390	10
Buffalo	40	5	750	10
Buffalo	6E	7½	1650	10
Spencer	075½	¼	60	12
Buffalo	5E	5	900	12
Gen. Blower	1601	1	100	16
Spencer	1002	2	225	16
N. American	316-C2-2	2	275	16
Spencer	1005	5	600	16
N. American	1716-G	5	675	16
Chgo. Blower	1607	7½	980	16
Spencer	1007-H	7½	1075	16
N. American	1716-H	7½	1100	16
Eclipse Fuel	6819-10	10	1200	16
Power Engrg.	2010	10	1120	20
Spencer	1203	3	335	20
Spencer	1215	15	1675	20
Ingersoll-Rd.	FS-377	85	10500	20
Ingersoll-Rd.	FS-377	150	15000	20
Ingersoll-Rd.	24C-223	3	270	24
Gen. Blower	2425	25	2500	24

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CENTRIFUGAL FANS

MAKE	SIZE	TYPE	Wheel Diam	Inlet Diam.
New York	36	ME	36	39½
U. S. Air	36	B/C	36	37½
Buffalo	6	LL	36½	37½
American	6	HS	36	37¼
Thermo Ht Fan	60	MIH	37¾	36
Clarage	3	HV	39	40¾
U. S. Air	39	M	40	34
Bayley	7	B/C	38½	39½
Sturtevant	8½	Des. 6	39¾	40½
Bayley	8	I	40	41
American	6½	B/C	39¾	45½
American	7	HV	44	50½
Buffalo	8	CL	48	48
New York	49	ME	49	53¾
American	9	AHS	53¾	61

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STEEL PLATE EXHAUSTERS

MAKE	TYPE	SIZE	Type Wheel	Wheel Diam
American	E	35	Rim	23
Sturtevant	Des. 2	40	Rim	24
Bayley	SS	30	SS	25
Buffalo	SP	40	Rim	26
Sturtevant	Des. 2	35	SS	27
Garden City	SP	30	Cycloid	28
Cyclone B.P.	SS	40	SS	29
Sturtevant	Des. 2	45	SS	32
Sturtevant	Des. 1	55	Rim	33
American	E	55	Open	36
Clarage	IE	23	Open	36
Garden City	Cycloid	55	Cycloid	39
Sturtevant	SS	50	SS	40
Sturtevant	SS	55	SS	44
Buffalo	SS	50	Wool	45
Alington-Cur.	SS	60	SS	48
Buffalo	SS	70	Cotton	48
Alington-Cur.	SS	70	SS	56
Sturtevant	ME	70	SS	56
Alington-Cur.	SS	80	SS	64

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- S.S. Heat Exchanger, 36-1½" tubes 16' long
- S.S. Heat Exchanger, 36-1" tubes, 16' long
- Fletcher 40" Centrifugal, 15 HP solid steel
- Baker-Perkins 20 cu ft Dbl arm Sigma Mixer
- Day 3 roll Mill, 12" x 32" Wtr cld. 10 HP
- Karbate Heat Exchanger, 178-1¼" tubes, 566 ft
- Williams size B Hammermill, 50 HP 3600 RPM
- Micro 24" Pulverizer, screw feed, 40 HP
- Buflovak 42 x 120 Double Drum Dryer
- Vulcan 48" Dia. Still, 30 bbl cap stl plts
- S.S. 2 Stage Evaporator, side heater 450 ft
- Sharples PY-14 Super-D-Canter, S.S. 10 HP
- 2-Gump 44-26 Electric Gr. Feeders. New
- Oliver 5 4" x 8' Precoat. All iron const.
- Proctor-Schwartz Apron Dryer, S.S. 5' x 50'
- Tyler-Niagara Screens, 36" x 72", 1 deck
- Elmco 8' x 8' rot. Vac. Filter. Complete
- Sparkler 18-S-8 S.S. Filter, Pump & Mtr.
- Simpson Mixmuller, size 2, 20 HP, jcktd
- Moore 4' x 5' Ball Mill, 15 HP t.e.f.c. mtr
- Moore 3' x 4' Ball Mill, 10 HP t.e.f.c. mtr
- Sperry 18" hr Filter, 25 recessed plates
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- Sedberry #3 Hammermill, 10 HP motor

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Day 70 cu. ft. Sifter & Mixer with automatic unloader having Falk Drive & 20 HP AC mtr.
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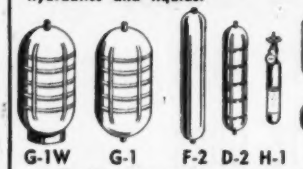

G-1W G-1 F-2 D-2 H-1

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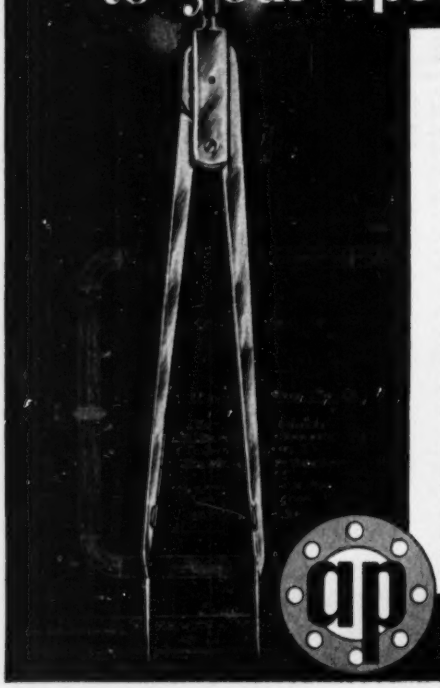

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4—Baker Perkins Steel Jacketed Mixers, Sigma Blades, 100 Gals.
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1—Type 316 Stainless Steel Tank with Coils. 3000 gals., dished head.
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25—Steel Storage Tanks, 9,000-17,500 Gals.
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1—Nash Hytor Vacuum Pump, Model #H-4 with 25 HP Motor.
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3—Nash-Hy-Tor Vacuum Pumps Model No. T.S.-12.
7—Alco Heat Exchangers, 380 Sq. Ft.

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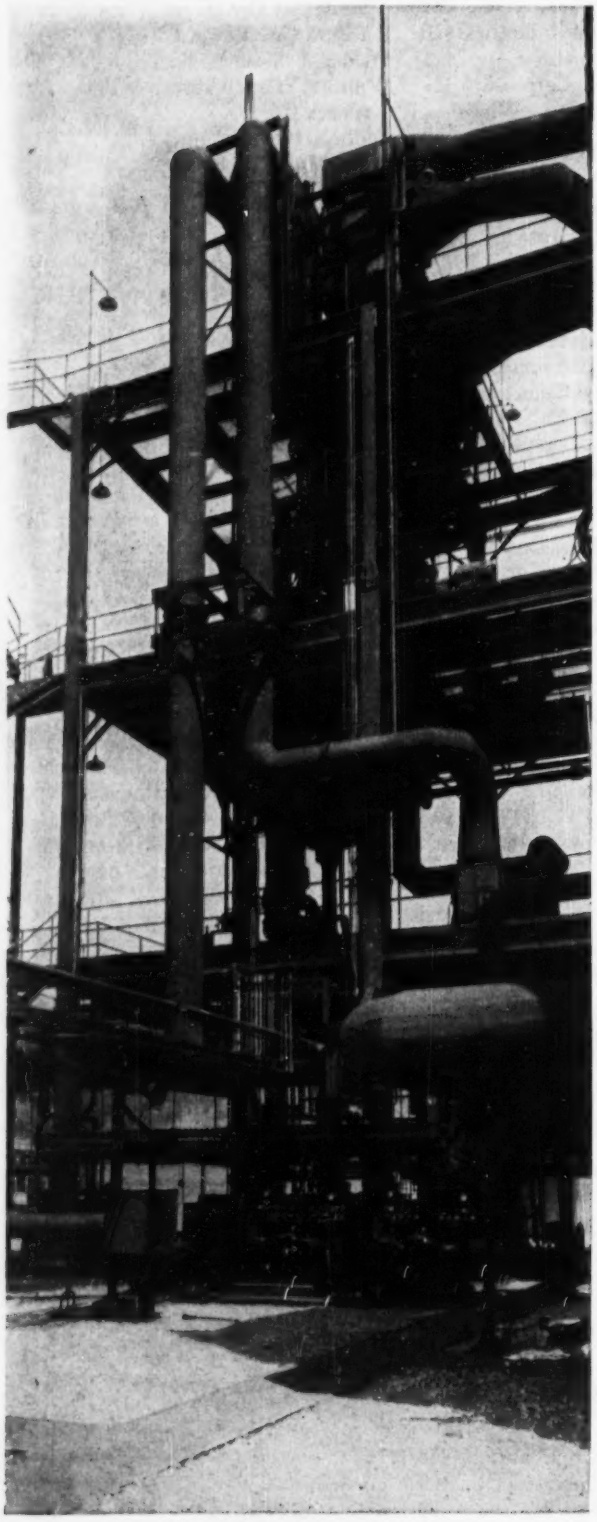

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Adhesives, Pressure Sensitive 476A — Solvent solutions of newly developed silicone materials not strictly adhesives because materials form no hard, brittle bond. Advantages, use, properties, etc. Dow Corning.

Air Pollution Control 476H — Determination of haze & smoke concentrations by filter paper samplers. Methods for sample evaluation, optical density, size of air samples, etc. Graphs & photos. Mellon Institute.

Aldehydes 476C — Describes aldehydes sold in commercial amounts & those available in research quantities in 36 p. Uses, applications, properties, specifications, etc. Book F-5278. Carbide & Carbon.

Alloy Products, Stainless 476D — Includes information on expansion joints, gas turbine power plants, ceramic coatings, shell mold castings, etc. for the oil & chemical industries. Illustrated. Solar Aircraft Co.

Alloys, Hard-Facing 429 — Superior resistance to corrosive agents, abrasion and galling. Spraywelding method of application quick & economical. Hard-facing Manual 77 & Spraywelder Catalog. Wall Colmonoy.

Balances Analytical 476E — Covers operation, maintenance & specifications & describes housing, compartmentation, beam, base, weights, stirrups & pan, damping, etc. Pamphlet CB 8/35M/K/52. C. A. Brinkmann.

Balances, Micro-Analytical 476F — Greater sensitivity & reliability in weighing samples up to 20 grams with accuracy of a few micrograms. Technical data & specifications. Pamphlet CB 15/5/53/3M. C. A. Brinkmann.

Batteries, Storage 476G — 60 p. with tables & illustrations, of new battery tools & auxiliary equipment. Lead-acid battery theory, care & operation of batteries, maintenance repairs, etc. Gould-National.

Bearings, Roller 282D — Improved internal design for spherical, self-aligning roller bearings results in greatly increased capacity & life. Advantages & pertinent data in illustrated 12 p. S. K. F.

Bellows, Metal Expansion 476H — For conveying gas & liquids. Welded-diaphragm construction helps withstand extreme temperature, vibration & corrosion. Specifications. Illustrated Bulletin 300. Titeflex.

Belts 424c — Compact, simple to install and maintain. Move packages up or down from floor to floor continuously. Belt widths—8, 12, 14, 18, 24, 30, 36 inches. Bulletin 63-D. Standard Conveyor.

Belts, V 241 — Links quickly joined by cup-washers & T-screws to make up individual belts. New link construction provides maximum flexibility for cooler, wear-resistant running. Manheim Manufacturing.

Bleaching & Germicidal Preparations 476I — Used as mild bleaching agent & as safe, effective, nonirritating germicide. Covers properties, compatibility, stability, formulation & processing, etc. Bulletin O-101. Monsanto.

Boilers, Automatic, Packaged 231 — Offer space-saving compactness, fast steaming, hospital-clean operation, fully automatic operating & safety controls, etc. In sizes to 500 hp; pressures to 250 psi. Orr & Sembower.

Boilers, Three Drum 476J — Water tube boilers feature large water holding capacity, fast steaming, large steam relieving surface, etc. Includes photographs & diagrams. Catalog SB-49. Erie City Iron Works.

Bronzes 476K — Low shrinkage, heat treatable bronzes for machine component pressure & bearing castings. Applications & compositions. Tables & charts. 12 p. Bulletin A107-8. International Nickel.

Burners, Gas-Oil 476L — Flexible, efficient & safe with no mounts to change & nothing to connect or disconnect for fast fuel changeover. Specifications & dimensions. Bulletin R-100. Eclipse Fuel Engrg.

Calculators, Enamel 476M — Coal tar base enamel quantity calculator gives estimates for quantities of enamel required in lbs. per 1000 feet & gallons per mile on two grades of primer. Reilly Tar & Chemical Corp.

Calculators, Weld Strength 476N — Indicate both size of weld needed for given applied load & weight of given length of weld in lbs. Give values for stresses ranging from 2000 to 20,000 psi. Lukens Steel Co.

Calorimeters, Oxygen Bomb 476O — Adiabatic type for determining thermal values of solid or liquid fuels. Describes applications, principle of operation & operating procedure, accuracy, etc. Parr Instrument.

Catalysts 51 — Manufactures to specification dozens of catalysts for many different & complex manufacturing processes—hydroforming, alkylation, dehydrogenation, etc. Harshaw Chemical.

Caustic Soda 145 — Effectively standardize processing methods. Inspections & analyses safeguard uniformity of caustic. Data sheets offered. Bulletin 100 describes products & services. Hooker.

Cements, Corrosion-Proof 390 — Data on basic types of corrosion-proof cements & constructions. Cement shown in its relationship to temperature & the broad classes of corrosives handled. Bulletin 5-2. Atlas Mineral.

Centrifugals 397 — Eliminate danger from explosive fumes & metallic friction. Includes data on separation, extraction, dehydration, clarification, impregnation, etc. American Tool & Machine.

Centrifugals 376 — Data on flexible continuous centrifugals with descriptions of adjustability features, full ball and roller bearing construction and self-cleaning feed chambers. Tolhurst Centrifugals.

Chemicals, Organic 476Q — 20 p. describes over 330 products & features 36 new chemicals. Arranged by family groups. Includes applications & physical properties. Booklet F-6136. Carbide & Carbon Chemicals.

Chlorine Bulletins 143 — #7—"Liquid Chlorine"; #8—"Alkalies & Chlorine in Treatment of Municipal & Industrial Water"; #11—"Water Analysis"; #14—"Chlorine Bleach Solutions"; etc. Solvay Process Division.

Cleaners 476R — Complete specifications for heavy-duty cleaner. Included are descriptions of the tank, motor, tank components & accessory cleaning tools for wet & dry pickup. Premier Co.

Cleaning Equipment, Gas 476S — Electrostatic precipitators for high dust collection efficiencies in cleaning open hearth stack gases at normal costs. Advantages in illustrated Bulletin OH. Research Corp.

Coatings, Protective 476T — Advantageous characteristics & usage of protective coatings for general protective & severe corrosive service. Also tank linings. Properties & applications. Nukem Products.

Coatings, Protective 476U — High solids content neoprene base coatings for protective service. Advantages, physical properties, application technique, corrosion resistance, etc. Bulletin 700. Carboline Co.

Coatings, Protective 476V — Performance & applications of silicone-based protective coatings. Resistant to thermal or chemical change. Describes three groups of finishes. Data Sheet 7-100. Dow Corning.

Coatings, Protective 104a — When correctly used, protective coatings outlast & outperform practically any coating on the market. Performance data in Bulletin 750. U. S. Stoneware, Plastics & Synthetics Div.

Coatings, Protective 476W — Quick and efficient relief for problems of corrosion, wear and water damage. Lists and describes many protective coatings for specific needs. Protective Coatings, Inc.

Coatings, Protective 476X — Successful use of protective coatings based on chlorinated rubber portrayed in 35 case histories. Performance data on finishes included. 20 p. Illustrated. Hercules Powder Co.

Coatings, Protective 342a — Coating systems developed to combat the primary causes of coating failure. Includes vinyl, phenolic, chlorinated rubber & fish oil formulations. Bulletin MC-7. United Chromium.

Collectors T446 — Provide efficient removal of air-borne contamination (dust, fumes, vapors, acid gases & odors) & recovery of product thru multiple washing action. Bulletin 610. Claude B. Schneible Co.

Compressors, Cylinder 281 — Eliminate detrimental oil-laden air. Cylinder compressors have carbon piston rings—need no oil or other lubricant. Three types available. Bulletin 728 Supplement D. Chicago Pneumatic.

Computers, Punched-Card 476Y — Universal calculating ability, flexible programming, removable control panels, high speed punching of results, etc. Advantages & applications. Brochure TM842. Remington Rand.

Conditioners, Water & Fluid 476Z — Remove & prevent scale & reduce corrosion in water or fluid systems. Describes drilling & production & flow line uses. Lists advantages Photos & diagrams. Evis Manufacturing.

Conduit, Electrical, Corrosion-Proof 69 — Chemical resistance of Electrunite "Dekoron-Coated" E. M. T. in addition to information on how to install it are included in Booklet DEK-1. Steel & Tubes Div., Republic Steel.

Connections, Swivel Air 477A — Slash pressure drop at the connection to only 5%. For air hose coupling on paint spray guns & other air-operated equipment. 360-degree swivel action. Bulletin Q-D. Binks Mfg. Co.

Construction Materials 407a — Acid-proof construction for chemical, steel, food & textile industries. Manufacturers of acid & alkali-proof cements, linings and coatings. Electro Chemical Engrg. & Mfg.

Construction, Materials of 477B — 30 p. with complete information on materials of construction shown to be satisfactory for chlorine dioxide production and bleaching processes. Atlas Mineral Products Co.

Contractors 314 — Describes air-break & oil-immersed contactors for starters. Either may be built into Type H starter along with meters, overload relays, etc. Bulletin 14B6410B. Allis-Chalmers Mfg.

Containers, Steel 477C — Directory of shipping container manufacturers. Quick product-manufacturer cross-reference & addresses for manufacturers' plants & offices. Steel Shipping Container Institute.

Controllers 477D — Describes valve-mounted controllers for high speed flow control applications. Covers typical flow control system. Specifications and diagrams in 8 p. Bulletin 470. Foxboro Co.

Controllers, Automatic 96-7 — Floating disc live-balance controller & full size 4"-chart recorder combined in compact assembly. Feature ease of operation, repeatability of action, etc. Bulletin 463. Foxboro.

Controllers & Recorders 102 — Fine performance & low maintenance stem from special features—locked-in synchronism, superb construction, power, sensitivity, etc. Catalog ND46(1). Leeds & Northrup Co.

Controllers, Temperature 477E — Specifications, application, prices, principle of operation, etc. for both single-point & new cascade models. Range covers —100 to +600°F. Bulletin P-811. Minneapolis-Honeywell.

Controllers, Thermometer 46-7 — Feature good readability, quick control check, control air check, variety of control, selection of ranges, compactness, simple setting. Bulletin 6401. Minneapolis-Honeywell.

Controls, Hydraulic 477F — Three types, front & rear mounted, available for operation of scrapers, shovels, loaders, etc. Cutaways, photographs, specifications in Form 30794. Caterpillar Tractor Co.

Controls, Motor 477G — Over 60 illustrations & charts in 36 p. Covers control arrangements available for large motor application. Developments in motor & personnel protective features. Elec. Machy. Mfg.

Controls, Motor 477H — Photos, charts, diagrams illustrate operation & application of high-voltage motor control. Advantages of coordinated control system. 16 p. Bulletin GEA-5409. General Electric.

Controls, Variable Speed 14 — Information on variable speed controls in 132 p. Offer infinitely variable, stepless speed adjustability. Capacities up to 87 horsepower with speed ratios to 16:1. Reeves Pulley Co.

Conveying Systems 293 — Select & apply right system for conveying dry pulverized & granular materials efficiently & economically. Illustrates & describes 4 conveying systems. Bulletin G-1. Fuller Co.

Conveyors 477I — Wide applications of power driven conveyors for handling materials throughout industry. Reduce non-productive labor costs. Illustrated Catalog 1053. Sage Equipment Co.

Conveyors, Belt 424b — Information on compact, mobile, self-contained powered belt conveyors. Easily maneuvered in confined areas. Handles commodities up to 150 pounds. Bulletin offered. Standard Conveyor.

Conveyors, Pneumatic 477J — Efficient, economical method of conveying dry, bulk powders, grains, pellets or crystals. Assure safe, sanitary & dust free conveying. Illustrated Bulletin 55. Vacu-Blast Co.

Conveyors, Screw 13 — 92 p. features uniformity of pitch, specially selected steels, wide range of hanger styles, gates easily installed on the job, accurately fabricated troughs, etc. Link-Belt Co.

Coolers, Cascade 296-7b — Corrosion-resistance prevents chemical attack inside tubes & permits use of river or sea water as coolant. Heat transfer nomographs, tables, etc. Catalog PE-8. Corning Glass Works.

Couplings, Flexible 477K — Meet power transmission requirements in wide range of types & sizes. Data on variable speed pulleys & transmissions & universal joints. Specifications. Lovejoy Flexible Coupling.

Couplings, Flexible, Geared 282E — New line of geared flexible couplings for high speed & high torque applications. Combine high load capacity with light weight & sturdiness. Outstanding features. Folder 2375 Link-Belt.

Demineralizers 399 — Sturdy mixed bed demineralizers offer simplified design, a new regeneration system, easy operation, etc. Ion-free water at low cost. Catalog 127. Barnstead Still & Sterilizer Co.

Demineralizers, Cartridge 477L — Low cost, mineral-free water in quantities up to 10 gal./hr. Operation is simple & foolproof & maintenance is low. Describes advantages of flow meter. Penfield Manufacturing Co.

Demineralizing 345 — Explains principles of ion exchange. Applications of anion & cation exchange materials. Design & operations of demineralizer systems. 39 p. Bulletin 5800. Cochrane Corp.

Design & Construction, Equipment 75a — Fabrication of vessels, agitators or precision machinery . . . to engineering, design & construction of process units or entire industrial chemical plants. Industrial Process Engr.

Desiaggers, Wall 477M — Shows how dual-motor drive and high striking power are combined to stop water wall slag build-up. Sketches and cutaway views included in Bulletin 1016. Copes-Vulcan Division.

Detectors, Leak 477N — For location of hidden fluid leaks in buried pipe lines. Locate leaks without visual surface indications. Eliminate costly exploratory excavations. Bulletin 93. J. W. Dice.

Detectors, Metal, Electronic 477O — Detect any kind of metal or alloy, magnetic or non-magnetic. Covers features, specifications, application, installation, operation, etc. in Catalog E 42. Radio Corporation of America.

Detergents 140D — Describes new high active, all purpose detergents —surface active agents instantaneously soluble in water. Applications & properties listed in Bulletin 55. Universal Detergents.

o-Dichlorobenzene 477P — Essential physical properties & information on safety precedures to be followed in loading & unloading, storing, handling & waste disposal. Safety Data Sheet SD-54. Mfg. Chemists' Assoc.

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Driers, Odorless 477R — Cobalt & lead driers retain metal concentrations & drying power without characteristic paint odor. Properties of naphthenate driers in Service Reports P-20 & P-21. Witco.

Drives, Mixer, Banbury 477S — For rubber mills. Installation & cutaway views of air-water cooled motor shows how designed for easy installation, low maintenance, long life. Bulletin GEA-5888. General Electric.

Drives Speed 477T — Positive, infinitely variable drives combine stepless speed control with positive features of chain drive for 20-25 hp requirements. 3 types available. Folder 2374. Link-Belt Co.

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Duplicating Patterns 477U — Basic material for preparation of duplicating patterns for Keller or Gorton duplicating machines possesses desirable qualities. Data on preparation, curing, etc. Furane Plastics.

Dust Collectors 384 — Describes dust control & its advantages. Large reclamation savings result from effective trapping of valuable chemical dusts. Maintenance costs lowered. Bulletin 909A. Pangborn Corp.

Dust Filters 404 — Furnished with self-adjusting blow rings which automatically compensate for any variation in filter tubes due to changes in temperatures, pressures, etc. Bulletin 528-R. Day Co.

Dyeing, High Temperature 477V — Dyeing of wool & other fibers at high temperatures under pressure. Impetus given to field by introduction of new hard-to-dye acrylic & polyester fibers. Bulletin 833. Calco Chem.

Technical Literature Now Available, *cont.* . .

Ejectors, Steam Jet 341 — Five bulletins cover complete range of commercially obtainable vacuum. Includes use of simple single stage ejector and huge multi-stage unit with intercondensers. Elliott Co.

Electronics Equipment 478A — Descriptions, applications & operating ranges for surge comparison testers, magnetic amplifiers, transistors, capacitors, relays, etc. Booklet B-6093. Westinghouse Electric.

Emulsifiers 138D — Four new emulsifiers for the formulation of liquid insecticidal & herbicidal concentrates. Covers emulsifiers, emulsion properties, etc. Bulletin B-53-1. Thompson-Hayward Chemical.

Engineering & Construction 478B — Photos & descriptive material cover gasoline plants, refineries, petrochemical process plants, catalytic cracking units & compressor stations. 24 p. Catalog RC5523. Fluor.

Engines, Gas Turbine 478C — Data on engines & 2 types of gas turbine driven generator sets. Specifications, advantages, sectional & cutaway drawing, engine performance chart, etc. Solor Aircraft.

Ethyl Cellulose 478D — Describes use in specialty coatings. Contains starting formulations for many applications. Data on solvents & stabilizers used in ethyl cellulose coatings. Hercules Powder Co.

Evaporators 478E — Diagrammatic flow chart shows complete indirect thermocompression or secondary recompression evaporation process. Covers applications. Bulletin 300. Mojonnier Bros. Co.

Exchangers, Scraped Surface 87 — Closed pressure-type systems which permit use of flammable, volatile & expensive solvents with greatest safety & no danger of solvent loss. Bulletin PE-1. Henry Vogt Machine Co.

Fabrication Facilities 478F — Facilities for custom fabrication of process industry equipment in standard & special alloys. Data on sizes & types of all production equipment. Bulletin 10. Quaid Fabrications.

Fabrication, Metal 387 — Manufacturers metal products for many industrial uses . . . from complete carbon-black plants to steel conveyor boxes. Designs, engineers, fabricates to specific needs. Boardman Co.

Fans, Duct 428a — Axial flow duct fan in elbow or straight line types. Compact, light weight, economical and designed to operate against static pressure. Bulletin F-10. L. J. Wing Manufacturing Co.

Fans, Propeller 478G — Specifications, dimensions, performance figures in 48 p. Describes 13 types of fans, 3 types of roof ventilators, unit heaters, intake air units. Bulletin A-109. Hartzell.

Fastenings, Stainless Steel 478H — In-stock inventory of cap screws, nuts, washers, wood screws, set screws, machine screws, etc. & pipe fittings for industrial use. 20 p. Catalog 53-B. Star Stainless Screw Co.

Feeders, Chemical 478I — Available in unplasticized polyvinyl chloride for applications which require good corrosion resistance characteristics. Low in initial cost & maintenance. Bulletin 541. Clarkson.

Feeders, Gravimetric 478J — For dry materials & offer wide feed range, low operating cost, high accuracy, large hopper capacity, dust-free operation, modern compact design, etc. Bulletin 30-K4. Omega Mach.

Feeders, Rotating Vane 343 — Feed hydrated lime into reaction tank in response to flow of acid waste and to degree of neutralization. Simple design and rugged construction. Bulletin 45-H8. Omega Mach.

Feeders, Volumetric 478K — Feature rugged construction, compact design, low filling height, dustless loading, etc. Feeding fluoride compounds at low rates with high accuracy. Bulletin 50-K3. Omega Mach.

Fiber Performance 478L — Techniques for studying performance in many types of fiber blends. Text & photos explain "inner structures"— how made & use in fabric quality studies & displays. Carbide & Carbon.

Filtration, Brewery 478M — Includes factors governing efficiency of beer filter systems, application of filter-aid filters in brewing practice, practical brewing & related tables, etc. Process Filters.

Filtration & Fluids-Handling B442a — Data for user of filtration & fluids-handling equipment. Includes articles on selection of filter media; drying of filter cakes; filtering brewer's mash; etc. T. Shriver & Co.

Fire Extinguishers 74 — Water-tight, corrosion-resistant construction, easy recharge without special tools, etc. for effectiveness & dependability. Describes all sizes. File No. B-202. Ansul Chemical Co.

Fire Fighting Protection 478N — Combination proportioners designed to introduce in proper proportion either mechanical foam liquid or a wetting agent. Inexpensive & light in weight. National Foam System.

Fire Systems, Automatic 391 — Extinguish fire, sound alarm, shut down equipment. For local application or total room flooding. Equipment & methods for protection against 590 fire hazards. Randolph Labs.

Fittings, Pipe 478o — Describes light weight alloy welding & flanged fittings. Includes welding fitting properties, characteristics & dimensions, & lap joint stub ends, ells, tees, crosses, etc. Robinson Corp.

Fittings, Welding 478P — 33 p. with typical installations, stock sizes, dimensions, weights, prices, sectional views, technical section, etc. Also trade practices. Catalog No. W-3. Bonney Forge & Tool Works.

Flatting Agents, Alkyd-Urea 55a — Alkyd–urea flatting agents for synthetic finishes. Also data on Syloid AL-1 (prevents pressure build-up in metallic paints). Use, properties, etc. Davison Chemical Corp.

Floors, Steel 478Q — Durable floor surface for areas of extreme production or traffic abuses. Advantages of steel floors in terms of materials used & installation methods. Flash-Stone Co.

Formalin Handling 289 — Manual covers unloading, storing, temperature effects, safety precautions, tankcar construction, methods of analysis, first aid, properties, specifications, etc. Celanese Corp.

Food Technology 478R — Describes services offered to food industries. Includes packaging, flavor evaluation, quality control, product development, food engineering & trouble shooting. Foster D. Snell.

Freeze-Drying 478S — Principles, methods, benefits of freeze-drying process. Typical processing problems solved by freeze-drying. Equipment & installations in illustrated Catalog 735. F. J. Stokes.

Furfuryl Alcohol 398 — Derived from agricultural residues & useful in manufacture of wide variety of products which include resinous mortars, cements, binders resins, textiles, etc. Bulletin 205. Quaker Oats.

Fuses 478T — Series of new bulletins illustrate & describe different fuses or fuse box products. Subjects include fuse pullers, clamps for fuse clips, plug fuses, etc. Economy Fuse & Mfg.

Gages 78 — "Floating Shank" automatically compensates for as much as 5/8" variation in center-to-center distance of the vessel tapping. Economical, accurate, durable. Catalog 35. Penberthy.

Gages, Plug 478U — Plain & thread reversible plug gages, AGD thread ring gages & setting plugs are described together with lapping by centerless method. Bulletin C-53. Size Control Co.

Generators, Cleaning 478V — Operation & principles of high-frequency sound cleaning with examples of applications. Photos & drawings show components. Specifications. Bulletin GEA-6056. General Electric.

Generators, Steam 410 — Factory assembled two-drum water tube boilers heavily insulated & steel cased. May be fired by gas or oil or combination burners. Safety controls. Catalog SB38CE-7. Erie City Iron.

Glycerine 478W — Versatility of glycerine as ingredient in commercial formulations. Covers six properties of glycerine & shows how producers put properties to work in new products. Glycerine Producers'.

Grinding Machines 478X — Fluid jet grinding machines designed to reduce solid materials to particle sizes in micron range. Describes operation & grinding data. Illustrated Bulletin 091. Sturtevant Mill.

Gum, Guar 140A — New vegetable colloid finds widespread applications. Describes hydrophilic colloid & offers data on its physical & chemical properties. 14 p. Illustrated. Stein, Hall & Co.

Gum Karaya 478Y — Information on importation, processing & usage of natural gum karaya. Shows ability to gel in cold water. Covers advantages & applications in illustrated 8 p. Morningstar, Nicol, Inc.

Heaters, Air M426 — Job performance efficient, economical, safe. Wide industrial use—drying, baking, curing, evaporating, digesting, sterilizing, etc. Literature Group 1153-12. Surface Combustion.

Heaters, Electric 103 — Ideal as permanent or portable heat sources in tanks, drums, process kettles & other containers. Available in types, sizes and wattages required. Applications. Edwin L. Wiegand Co.

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Heating & Steam Generating 479A — Includes information on tank car heaters, bituminous boosters, steam boilers, etc. Specifications & typical installation pictures in bulletin Form AD-109. Cleaver-Brooks.

Hoists 479B — Illustrations, descriptions & specifications for over 100 types & sizes of portable hoists. Includes ratchet lever hoists—roller & coil chain models. Bulletin CL. Coffing Hoist.

Hose, Flexible Metal 41 — For tough fluid & gas handling jobs. Durable & leak-proof for conveying, controlling movement & vibration, correcting misalignments, etc. Bulletin 20D. Atlantic Metal Hose.

Humidity Conditioning 427 — For atmospheric moisture problems. Used for packaging, processing, etc. of many products. Prevents frost, condensation, corrosion. Literature Group K-53-5C. Surface Combustion.

Identification Marking Machines 479C — Automatic production line machines for identification marking & code-dating of packages & products. Also automatic bulk-fed & semi-automatic marking machines. Adolph Gottscho.

Indicators, Electronic Level 402a — Measure continuously, with accuracies to ± 2% the levels of liquids, viscous fluids, powders or granular solids. Remote readings recorded at distances greater than a mile. Fielden.

Indicators, Miniature 71 — Feature flange-to-flange flush mounting; drum dial, linkless mechanism; scale-set adjustable high/low operating guides & alarms; etc. Illustrated Catalog 55–10. Fischer & Porter.

Instrument & Control Boards 479D — For production & quality control. Control switchboards for centralized operation of remote apparatus in large industrial plants. Bulletin 700. Continental Electrical.

Instruments & Controls 134–5 — Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity. Bulletin 98151. Taylor Instrument Companies.

Instruments, Testing 479E — Economical & safe checking & calibrating of current actuated devices . . . motor starter overload relays, reclosers, circuit breakers, etc. Specifications. Catalog 953. Multi-Amp.

Insulation, Pipe 479F — Advantages of cellular glass insulation for pipe temperatures between −300° and +800°F. Properties, specifications, installation in illustrated folder. Pittsburgh Corning.

Joints 479G — Universal joints are precision ground from the highest quality heat-treated alloy steel and are concentric to 0.001 inch. 13 sizes. Bulletin 800. Lovejoy Flexible Coupling Co.

Joints & Couplings 396b — Teflon expansion joints and flexible couplings absorb shock, vibration, thermal expansion and contraction. Connect unlike piping ends & nozzles. Bulletin FC 952. United States Gasket.

Joints Expansion 334 — Leakproof, maintenance-free pipeline motion control in compact, easy-to-install, in-line unit. Included are detailed specifications, selection & application data. Flexonics.

Joints, Expansion 479H — 24 p. with engineering application & selection data for solution of pipeline expansion problems. Contains schematic piping layout. Types available. Catalog 135. Flexonics Corp.

Joints, Rotary Pressure 479I — Serve as pipe union between revolving steam drums or tilting kettles & stationary pipe line. Requirements, correct installation, drawings, etc. Bulletin 5080. Seamlex Co.

Joints, Swivel 479J — Self-aligning joints provide flexibility in piping. Specifications, dimensions, application data for entire line. 14 styles & 8 sizes available. Catalog 265-A. Barco Mfg.

Kiln-Ends, Air-Cooled 479K — Designed to keep discharge end of kilns cool, round & rigid. Available as integral part of new kilns or as replacement item. Economical operation. Bulletin 07B8040. Allis-Chalmers.

Kilns, Rotary 310 — Parts are precision designed and built to give maximum protection against mechanical troubles of all kinds. Includes application data in illustrated Bulletin A-442. Vulcan Iron Works.

Labels 479L — Self-sticking special markers or labels with any wording, trade mark, number, etc. in size, color, shape desired. Includes Dispenser Card. Illustrated Bulletin 132. W. H. Brady.

Laboratory Layout Kits 479M — Consist of 26 accurately scaled 3-dimensional models corresponding to full size sectional metal furniture described in accompanying 28 p. illustrated Catalog F-153. Labline.

Lapping Machines, Centerless 479N — Reduce production costs & give highly accurate results. Finishes of less than 1 micro-inch RMS. Eliminate ring lapping without highly skilled labor. Bulletin L-53. Size Control.

Lead Chemical Construction 479O — Process described in pictorial flow sheet reprint represents an excellent example of the use of lead in modern chemical construction. Bulletin 8. Lead Industries Association.

Lifters, Drum 479P — Economical, dependable & durable for all types of lifting, stacking & loading of bulk material drums, either at plant or at construction site. Specifications. Lexsuco, Inc.

Linings, Drum, Vinyl 342b — Drum linings resist many chemicals. Successfully tested in contact with organic sequestering agents, sulfonated oils and textile finishing agents. Bulletin DL-1. United Chromium.

Locomotives 479Q — Describes 70-ton, 600 hp locomotive. Covers over-all locomotive performance, power plant, electric drive, equalized swivel trucks, etc. Illustrated Bulletin GEA-4657B. Gen. Elec.

Lubrication, Centralized 479R — Centralized systems of lubrication result in increased production & lowered costs. Covers automatic pumping units, clearing presses, spray valves, etc. Farval Corp.

Lubrication, Flour Mill 479S — Insures cleanliness and safety in flour mill lubrication. Economical, dependable method of lubricating hundreds of bearings. Simple & easy to install. Bulletin 25. Farval Corp.

Magnet Selector Charts 479T — Aid in selecting most efficient plate magnets to separate tramp iron from materials conveyed in chutes. Face of chart contains diagrams & tables with explanatory captions. Eriez Mfg.

Magnets 217a — Line of electric and non-electric magnets for installation in, on or above material conveying systems and integration with processing machinery. Catalog C-5000-B. Dings Magnetic.

Measurement, Variables 479U — Determining the level, weight, displacement, composition, thickness, moisture, and other previously unmeasurable characteristics of difficult fluids and solids. Foxboro Co.

Metal Working Processes 479V — For steel boats, wire screen, alloys, process equipment, tool steels, pipe lines, snowplows, etc. In 89 p. Production methods of 7 company divisions. Illustrated. Continental Copper.

Meters 479W — For measuring tank contents any distance away. Tank may be buried, elevated, open, closed, vented or under pressure or vacuum. Also hydrostatic gages for all purposes. Uehling.

Meters 479X — Stainless steel chemical meters for accurate volumetric measurement of corrosive products, including caustic soda, concentrated sulphuric acid, ammonia, etc. Buffalo Meter Co.

Meters, Liquid 432 — For exact automatic formula control. Eliminate spoilage, spillage, over-filling & unsanitary muss & fuss of gauge sticks, pails or batch tanks. Bulletin 566-M. Neptune Meter Co.

Meters, pH 385 — Unusually compact, utilizing subminiature components & printed circuits. Signal to recorder accurate within ± 0.02 pH. Simplified maintenance. Data File 86-14. Beckman Instruments.

Meters & Valves 479Y — Best features of decentralized small plant operation. Subsidiaries & divisions manufacture gas, water & oil meters, cast & forged steel valves, saws, etc. Rockwell Mfg. Co.

Micrometers, Electronic 479Z — For measuring thickness of any material. Applicable to hard or soft materials, conducting or non-conducting. Describes typical uses. Bulletin 4001. J. W. Dice Co.

Micro-Micro-Ammeters 280A — Offer accuracy & ruggedness at low cost. Measure, record & control microcurrents on order of one millionth of a millionth of an ampere. Bulletin 332-14. Beckman Instruments.

Microscopes 479AA — Designed with heating stage, temperature control & illuminators. All parts combined in a single unit. Covers specifications & features in Pamphlet CB/20/9/53/2M. C. A. Brinkmann.

Mills, Grinding 275a — For wet or dry, coarse or fine grindings. Design of grinding mills for improved quality & reduced operating costs. Construction features in Bulletin 8121. Traylor Engineering & Mfg.

Mildew Preventive 138B — Effective & permanent treatment for prevention of bacteria damage. Eliminates need for bacteriacides in mills to check mildew. Covers application & usage. F. C. Huyck & Sons.

Mills, Laboratory 479BB — Apply "shock" treatment to liquid. Liquid may be clear or a flowable suspension carrying any desired content of solid particles. Use, operation, specifications. Rafton Engrg.

Mills, Pulverizing 479CC — Describes hammer-type pulverizing mill with screen separation. Suitable for grinding or disintegrating great variety of medium soft materials. Bulletin 73. Raymond Div.

Mills, Pulverizing 378 — Designed for grinding or disintegrating a wide range of medium soft materials to specified screen fineness where moderate capacities are required. Bulletin 73. Raymond Division.

Mills, Rolling 479DD — Construction features & advantages of small, low-cost, precision-built laboratory & production rolling mills. Photos & specification tables. Publication 121. Stanat Mfg. Co.

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Mixers, Industrial 480A
Feature variable speed, removable stirrer, adjustable height. Designed for mixing paints, chemicals, etc. Sizes ½ to 10 HP. Other mixers described. Bulletin 531. Conn & Co.

Mixers, Vertical 480B
Photos illustrate various mixers. Includes mixers with variable speed drives & sizes ¼ to 25 HP inclusive. Also data on side entry agitators. Bulletin 532. Conn & Co.

Molybdenum, Sprayed 288C
Expanded use of Sprabond wire-essentially pure molybdenum, in a form suitable for metallizing use. Includes characteristics & applications in Bulletin 57C. Metallizing Engineering Co.

Motion Pictures, Industrial 480C
Cites uses & advantages in 12 p. Perform important functions for management in fields of public relations, selling & sales promotion, production, etc. Wilbur Streech Productions.

Motor Bases, Tilting 480D
For use with variable speed pulleys. . . . as a belt tightener for standard sheaves. . . . for easy belt changing on cone step pulleys. Bulletin 900. Lovejoy Flexible Coupling Co.

Motor Frame Selection 480E
Reference for determining differences in frame dimensions. Shows comparison between old & new NEMA standard dimensions for a-c motors from 1 to 30 hp. Westinghouse Electric Corp.

Motors 480F
Contains new NEMA standards for 1 to 40 HP induction motors. Includes a comparison of principal dimensions of new and old NEMA frames. 8 p. Bulletin 1600. Louis Allis Co.

Motors, Gear 480G
Features of gear unit & motor discussed. Gear ratios for single, double & triple reduction types given. Describes complete line. 15 p. Booklet B-5645. Westinghouse Electric.

Motors, Gear 311
Feature precision processed, file-hard gears, large oil reservoir for abundant splash lubrication, heavy, rigid cast iron pyramidal base, etc. From 1 to 150 hp. Crocker-Wheeler Div.

Motors, Gear, Dripproof & Enclosed 452-3a
For longer motor life, greater installation and maintenance savings, superior performance. Bulletins GEA-6013 (Dripproof); GEA-6027 (Gear); GEA-6012 (Enclosed). General Electric Co.

Motors, Synchronous 480H
Explains electrical operation & areas where control is essential. Describes various control units & offers rating & dimension data. Illustrated Bulletin GEA-5873. General Elec.

Motors, Variable Speed 222-3
Remote controls start, stop & regulate speeds sensitively set to a split rpm. Covers mechanical & electrical controls. 16 p. Motor Booklet features 22 models. U. S. Elecl. Motors.

Nozzles, Spray B440
For spraying, washing, rinsing, cooling, etc. No internal vanes or other restrictions which clog or hinder flow. In wide range of sizes & capacities. Bulletin N-617. Yarnall-Waring.

Oils 480I
Outlines company's history since founding & contains a consideration of operation today with a short description of 13 basic products. 16 p. Pennsylvania Refining Co.

Optical Gaging 480J
Instruments for production inspection feature simplicity, convenience of operation, clear, sharp image, wide angle screen, etc. Specifications. 6 p. Optical Gaging Products.

Ovens, Industrial 480K
With latest improvements for foundries, rubber manufacturers, metal finishers, etc. Design features and engineering flexibility of 13 types. Bulletin 200, W. W. Sly Mfg. Co.

Packers, Bag 243
Better protection, faster packaging at lower cost. Close open-mouth, multiwall paper bags semi-automatically. Tape & sew 15 bags a minute. Booklet ET-E12. International Paper Co.

Packings, Teflon 401
Cut packing replacement and maintenance costs. Stop leakage by providing tight seal at only slight gland pressure. Last for many months under corrosive conditions. Chemical & Power.

Paints, Anti-Rust 480L
For use on all metal surfaces & applied with a minimum of surface preparation. Resist temperature changes by expanding & contracting with metal surfaces. Bulletin 55319-R. Speco.

Panels, Neoprene 403
Solve flow stoppage problems and help reduce operating expense. Resistant to oils and most chemicals and are tough enough to withstand severe abrasive service. Gerotor May Corp.

Paving Breaker Tools 480M
Complete line of tools & accessories for paving breakers. Includes illustrations, specifications, applications, table of weights, sizes, etc. Form 4126. Ingersoll-Rand.

Peroxygen Chemicals 480N
Describes bleaching methods for cotton, rayons, nylon & animal fibers. Cold bleach & continuous bleach processing covered in detail. Bulletin 52 now available. Buffalo Electro-Chemical.

Petroleum Products 480O
Contains descriptive data, specifications and applications for white oils, petrolatums, odorless solvents, petroleum sulphonate, and soluble oil bases. Pennsylvania Refining Co.

Photographic Reproduction Materials 480P
Covers characteristics of reproduction materials. Also projection positive and microprint paper with data on sheet sizes, roll sizes, and packings. 24 p. Eastman Kodak.

Pipe & Fittings, Glass 480Q
Physical properties, economy of operation & maintenance, ease of cleaning & installation, specifications, etc. Includes new line of sink traps. Illustrated. Corning Glass.

Pipe & Fittings, Installation 296-7a
Durable glass pipe offers clear, transparency, non-contamination, corrosion resistance, light weight. Catalog EA-3. Picture-pages of installations in Catalog EA-1. Corning Glass Works.

Pipe Layers 480R
Built to lift, carry & place heavy, unwieldy line pipe. Mounted on tractors & feature economy & ability to work in tough terrain. Illustrated Form D377. Caterpillar Tractor.

Pipe, Plastic 480S
Describes two principal types of plastic pipe made, shows how to join plastic pipe & lists engineering & corrosion data. Illustrated in 12 p. Adv. 603. Republic Steel Corp.

Pipe, Valves & Fittings 431
The installation of large diameter Saran rubber lined pipe, fittings and valves safely transports de-ionized water without contamination. Catalog now available. Saran Lined Pipe Co.

Plastic Sheets 480T
Clear cast thermoset plastic sheets feature high abrasion and heat resistance, toughness and solvent resistance. Applications, properties, fabrication data. Cast Optics Corp.

Plastics 480U
Company makes available literature containing a series of tables which give chemical & physical properties of fifteen different plastics. Atlas Mineral Products Co.

Platecoils 10
For tank heating & cooling problems due to inefficient pipe coils. Platecoils saves 50% in heat transfer costs & requires 90% less cleaning. Bulletin P61. Tranter Manufacturing.

Polyvinyl Acetate Emulsions 480V
Used as basic material in adhesives for wood, fiber, cork, ceramics, leather, etc. Covers uses, applications, properties. Includes data on handling & storage. Colton Chemical Co.

Positioners, Force-Balance 480W
For cylinder-operated devices. Will position equipment needing high power & long stroke. Unit characteristics & operation, specifications, etc. Bulletin 473. Foxboro Co.

Potentiometers 480X
Miniature gage pressure potentiometers in standard ranges from 0-100 to 0-5000 psi Photos, diagrams, curves, charts, outline drawings. Specifications. Bourns Labs.

Power & Fluids 480Y
Covers power and fluid handling fields. New product applications, processes, and methods. Also installations, operation, maintenance of industrial apparatus. 20 p. Worthington.

Pressure Reaction Apparatus 480Z
Shaker type for catalytic reduction & other reactions with hydrogen at pressures up to 5 atm. Principal parts & features, specifications, applications, etc. Parr Instrument.

Pulleys, Magnetic 73
For tramp iron removal. Design & position of magnets provide a uniform, powerful pulling force. Operates anywhere with no current required. Bulletin 350C-1. Stearns Magnetic.

Pulleys, Variable Speed 480AA
Advantages of ¼ to 8 hp. pulleys described. For use with a constant speed motor. Speed ratios up to 3 to 1. Includes construction features. Bulletin 700. Lovejoy Flexible Coupling.

Pumps 277e
Literature describes close-coupled pumps for alloy construction. Compact, sturdy and easily installed. Shafts in permanent alignment. Details in Bulletin 975. Buffalo Pumps, Inc.

Pumps 325
Corrosion-resistant pumps with increased size & capacity range. New CNG Worthite pump in 21 sizes, ¾" to 6", up to 2000 gpm. Heads up to 200 feet. Bulletin W-350-B14. Worthington.

Pumps 323
Reduce maintenance cost. Feature rugged construction & design simplicity. Wearing parts replaced easily, quickly, at low cost. Pumps range from 10 to 2400 hp. Aldrich Pump Co.

Pumps 89
Prevent loss of valuable liquids—keep explosive, toxic & highly volatile liquids sealed in. Totally enclosed, leakproof, with no shaft seals or stuffing boxes. Chempump Corp.

Pumps, Acid 480BB
Submersible acid pumps with vertical shaft for pumping acids or slimy liquids from containers, tanks, pits, etc. No priming is required. Simply serviced. Neumann & Welchmann.

Pumps, Acid, Centrifugal 480CC
Acid pump without a stuffing box. Renewable parts reduced to minimum giving great safety in operation with low maintenance. Advantages & construction. Neumann & Welchmann.

Pumps, Boiler Feed 277g
Detailed information on multistage clear water pumps for pressures up to 500 psi. Rugged and efficient boiler feed pumps used widely. Offers Bulletin 980. Buffalo Pumps, Inc.

Pumps, Boiler-Feed 352 — Service-proved, 8-stage Class HMTA boiler-feed pumps can deliver 300 gpm of 345° feed water at 1095 psi. Feature modern "Unit-Type Rotor" design. Catalog 7233. Ingersoll-Rand.

Pumps, Centrifugal 355a — Company provides literature describing advantages and use of corrosion-resistant pumps for an extremely wide range of applications. New Catalog 253 available. Tri-Clover Mach. Co.

Pumps, Centrifugal 92 — Mechanical seal offers new development in pump design—eliminates leakage & assures trouble-free life. Capacities to 1200 GPM, heads to 400 feet. Catalog ET-452. Bell & Gossett.

Pumps, Centrifugal 411 — Offer high quality design & materials; maximum standardization & interchangeability of parts; heads up to 260 ft.; capacities 200-6400 gpm; 19 sizes; etc. Bulletin 721.6. Gould Pumps.

Pumps, Centrifugal 359 — Two-stage horizontal pumps designed for long-range, low-cost service. In capacities from 75 to 3000 gpm, sizes from 2" to 8" discharge, & heads to 750 ft. Bulletin 1501. De Laval.

Pumps, Centrifugal 481A — Data on corrosion resistant process equipment. Covers centrifugal pumps, valves, pipe & fittings in both natural & buna "N" hard rubber. Pump capacities from 15 to 100 gpm. Vanton.

Pumps, Centrifugal 481B — Pumps operate without sealing water. For pumping abrasive or corrosive solutions that must be delivered undiluted. Molded rubber protective parts. Brochure 853. Allen-Sherman-Hoff.

Pumps, Centrifugal, Heavy-Duty 481C — Handle very dirty, muddy, thick, viscous and solid-bearing liquids or corrosive substances and pulps. Describes design, construction, service range, etc. Neumann & Welchmann.

Pumps, Chemical 481D — Contains description and essential advantages of centrifugal pumps with pressure-relieved stuffing-box for the chemical industry. Two basic designs. Neumann & Welchmann.

Pumps, Chemical 249a — Corrosion-resisting, heavy-duty chemical pumps for long, trouble-free service. In 12 standard alloys to provide best service in various corrosive conditions. Bulletin P/1. Duriron Co.

Pumps, Chemical Service 277f — Bulletin available which describes chemical service pumps. Suitable for construction in most machineable alloys. Full ball bearing single suction. Bulletin 982. Buffalo Pumps.

Pumps, Double Suction 277h — Describes advantages and features of double suction clear water pumps. Hydraulically balanced and of finest obtainable construction. Offers Bulletin 955. Bualo Pumps, Inc.

Pumps, Gear 40 — Capacities from 1 gph to 1000 gpm & pressures to 3500 psi. Types & sizes available, characteristics, uses. Photos, cutaway drawings, & tables. Bulletin 17-A Schutte & Koerting.

Pumps, Gear B439 — Cut costs pumping fluids & semi-fluids, 32 SSU to 250,000 ssu. Capacities 1-500 gpm. 300 psi for continuous duty 500 psi for intermittent service. Features. Sier-Bath Gear & Pump.

Pumps & Motors 481E — Describes variable delivery pumps, constant delivery pumps, duplex pumps, feed pumps, constant displacement motors, etc. Specifications. Bulletin 10051-C. Oilgear Co.

Pumps, Paper Stock 277d — A pump for every liquid, consistency and head. Non-clogging enclosed impellers retain initial efficiency. Mill proven for many years. Bulletin 953 available. Buffalo Pumps, Inc.

Pumps, Piston-Diaphragm 15 — For controlled-volume pumping of fluids. Flow charts, applications, description & specifications of models of various capacities & constructions. Bulletin 300. Lapp Insulator.

Pumps, Plastic 481F — Low cost, self-priming pumps ¾" port sizes, suitable for pharmaceuticals, descaling, hypo & film solutions, muriatic solutions, etc. Features in Bulletin JPS-3010. Jabsco Pump.

Pumps, Positive Displacement 481G — For accurately feeding chemical solutions used in water works & industry. Covers performance, installation, applications, specifications, etc. Bulletin PM-20. Precision Machine Co.

Pumps, Proportioning 107 — For additives or chemicals reagents. Meet most requirements for low capacity medium pressure chemical feed pumps. Durable, compact, inexpensive. Bulletin 1105. Proportioneers.

Pumps, Rotary T444 — Feature fast, thorough stripping action. Efficient stripping is possible because of suction lift created by "gear-within-a-gear" pumping principle. Bulletin 54SC. Viking Pump Co.

Pumps, Rotary Gas Ballast 357a — End water vapor trouble and maintain fast pump down time. Available in complete line of vane, piston-type & 2-stage pumps. Principle, operation, construction, etc. National Research.

Pumps, Screw Impeller 481H — For lifting large amounts of slimy or viscous liquids against low heads at relatively high speed. Adapted for high suction. Uses, advantages, construction. Neumann & Welchmann.

Pumps, Sewage 277b — Describes non-clogging sewage pumps for trouble-free sludge circulation, agitation and removal. Available in vertical or horizontal models. Bulletin 964-G. Buffalo Pumps, Inc.

Pumps, Sewage & Sump 481I — Covers 3 types: vertical, wet pit single or duplex; vertical dry pit; horizontal. Specifications, performance tables, dimension drawings. Bulletin 325-A. American-Marsh.

Pumps, Sump 277c — Company offers literature covering sump pumps. Complete units ready to install. No stuffing boxes required. Ball bearing thrust & enclosed shaft. Bulletin 963-F. Buffalo Pumps, Inc.

Pumps, Vacuum 481J — Compact rotary oil vacuum pumps. Superior design, workmanship & materials for high efficiency. Graphs, features & specifications in Pamphlet CB 17/2M/8/53. C. A. Brinkmann.

Pumps, Vertical T418 — Pumps designed to handle molten sulphur. Steam jacketed discharge pipe keeps molten materials from solidifying. Operates efficiently at slow speed of 1750 rpm. Bulletin V-837. Taber Pumps.

Purifiers, Filterless 481K — Eliminate entrainment from vapor lines. Uses, advantages, operation. Charts enable size selection for best efficiency at various flows & pressures. Bulletin 201. V. D. Anderson.

Pyrometer Calibration 481L — New tables based on data released by National Bureau of Standards. Corrected to absolute volt & to the International Temperature Scale of 1948. Bulletin P1259. Bristol Co.

Radiation Detection 481M — 58 p. illustrated detection equipment selection guide. Covers electronic equipment, radiation counter tubes, glass apparatus, etc. Catalog 15. Radiation Counter Labs.

Radio & Electronics 481N — Over 1,000 p. reference book-buying guide of radio & electronics industry. Lists nationally advertised radio & electronic parts, components, equipment. Federated Purchaser.

Recorders, Analog Data 481O — Provide visual or printed records of almost any physical quantity converted into a corresponding voltage. Describes features & applications. Illustrated. Streeter-Amet Co.

Reducers, Speed 327 — High and low speed shafts suitable for v-belt, gear or chain as well as coupling connections. Feature sealed housings, positive lubrication, precision gearing, etc. Bulletin 1104. Falk.

Refractometers 481P — Industrial refractometers feature convenience of operation, speed of measuring, increase of accuracy, ease of maintenance. Specifications. Pamphlet CB7 8-52 2M. C. A. Brinkmann & Co.

Resin Raw Materials 481Q — Experimental product for applications where urea or melamine are now used. Covers suggested applications, properties, handling & storage, etc. Bulletin PD-B-1. Nitrogen Division.

Resins, Dispersion 481R — Covers uses, properties & methods of applying Bakelite vinyl resin-base organosols, plastisols & plastigels. Illustrated with 15 typical applications. Booklet VE. Bakelite Co. Div.

Resins, Ion Exchange 400 — Chemically and physically stable for long life at top efficiency. Two anion exchangers are available to meet conditions of water supply. Data on silica removal. National Aluminate.

Respirators 65 — New interchangeable respirators which can be used for organic vapors, for dusts & organic vapors, for paint spray, for acid gases, for dusts & mists, etc. Willson Products, Inc.

Respirators, Twin Cartridge 93b — Provide safe protection for multi-respiratory hazard operation. One face mask along with seven sets of cartridges actually do the work of seven respirators. American Optical Co.

Rhodium Plating 481S — Data and directions for electroplating with rhodium. Describes applications, properties, corrosion resistance, thickness specification, plating cost, etc. Baker & Co.

Rod Selector Charts 481T — Aid in selection of proper welding alloy for specific job. Over 160 low temperature welding alloys-bonding points, tip colors, tensile strengths, etc. Eutectic Welding Alloys.

Rolls 481U — Metal, rubber, wood & plastic rolls in illustrated 48 p. Includes dimension sheets for use in supplying specifications on rolls, fulling-mill lags, etc. Catalog 48. Rodney Hunt.

Rubber Products 481V — Covers facilities for producing quality rubber products through engineered compounds. Major producers of O-rings for hydraulic & pneumatic design applications. Goshen Rubber Co.

Safety Devices 481W — Catalog & price list of safety devices for steam & hot water boilers & hot water tanks. Includes service recommendation chart for control selection. McDonnell & Miller.

Safety Equipment 481X — First aid kits feature first aid supplies of pharmaceutically controlled quality. "Control number" shown on every unit package and kit. Bulletin 0401-2. Mine Safety Appliances Co.

These new bulletins and catalogs will help you stay up-to-date.

Technical Literature Now Available, *cont* . . .

Safety Equipment 482A
64 p. with many types & sizes. Includes safety glasses, welding helmets, face shields, masks, hoods, aprons, sleeves, face shields, etc. Illustrated Catalog 27. Chicago Eye Shield.

Scales, Pneumatic Weighing 482B
New Platform scales adaptable for batch weighing or continuous process control. Describes features, specifications, accessories, operation, etc. Catalog 10. Weighing Components.

Sigma Formation 482C
Sigma formation & its effect on impact properties of iron-nickel-chromium alloys. Study of brittle, metallic compound. Graphs & tables. Bulletin A-154. International Nickel.

Silica Gel 482D
Refrigeration desiccant with greatly increased moisture adsorption capacity. Reduces moisture level of Freon 12 to less than 10 ppm at temperatures as high as 160°F. Davison Chemical.

Silica Sand 482E
Study on recovery of low iron silica sand by flotation. Describes each step of flotation process & deals with typical problems. Flowsheet Study M7-F25. Denver Equipment Co.

Silicon Carbide 482F
52 p. brochure describes properties of silicon carbide as related to varied applications & outlines manufacturing techniques. Includes extensive bibliography. Carborundum Co.

Silicone Rubber Paste 482G
Shows superior handling characteristics, maximum abrasion resistance, good dielectric properties for coating glass cloth or organic fabrics. Applications. Dow Corning Corp.

Silicone Rubber Stock 146B
Easy-to-handle, fully compounded molding material for gaskets, O-rings, seals, diaphragms, bellows, etc. No toxic additives. Includes advantages and properties. Dow Corning Corp.

Slings, Woven Wire 482H
Feature safety, flexibility, strength and low maintenance in materials handling. Typical applications, sling fabrics, engineering data, prices, etc. Cambridge Wire Cloth Co.

Sodium Carboxymethylcellulose 482I
For solids suspending, film-forming, adhesive applications, etc. Data on water solubility, suspending power, adhesive and film-forming properties. Illustrated. Hercules Powder Co.

Solvents, Lacquer 482J
Cellosolve acetate widely used in furniture & metal lacquers. Physical, chemical & physiological properties, specifications, shipping data, etc. Bulletin F-8296. Carbide & Carbon.

Spectrographs 482K
Plane grating spectrograph for high dispersion analysis, low concentration samples, study of line shapes. Schematic drawing & specifications. Catalog EB-10-53. Jarrell-Ash.

Spectrometers, Mass 482L
For chemical analysis by mass separation. Covers operations procedures & component parts & lists range, resolution, & system specifications. Bulletin GEC-587A. General Elec.

Spectrophotometers 280F
Automatic recording spectrophotometers run analyses practically unattended & with accuracies exceeding the best manual operation. Data File R-58-14. Beckman Instruments.

Spectroscopy 482M
High resolution nuclear magnetic resonance spectroscopy for structure determination & identification of components in mixtures. Tabulation of gyro-magnetic data. Varian.

Steel Hardening, Stainless 482N
Illustrated, 64 p. on the method of hardening precision stainless steel parts. Hardens parts to estimated 2,000 Brinell without change in physical quality. C. U. Scott & Son.

Steel, Stainless 349
Will reduce shutdown time & add to equipment life. Features superior corrosion-resistance to sulphuric acids, plating & pickling solutions, mixed acids, etc. Carpenter Steel Co.

Steels at Low Temperatures 482O
Bibliography on low temperature characteristics of steels with author index. 468 U. S. & foreign articles, translations, books, etc. 48 p. Bulletin A-157. International Nickel.

Steels, Stainless, Austenitic 482P
Covers corrosion-resisting properties in 32 p. with 18 tables. Tests on austenitic stainless steels in various solutions . . . acid, neutral & alkaline. Bulletin A-49. International Nickel.

Surfacing Materials B434
Bulletin on acid, alkali, solvent—proof topping for floors, walls, acid holding tanks, waste disposal systems, etc. Applications and corrosion-resistant properties. Ceilcote Co.

Switches 58a
Performance & advantages described for various switches. Included are float switches, fluid level switches, flow switches and indicating switches. Revere Corporation of America.

Switches, Electronic Level 482Q
Accurate, dependable & inexpensive for solids, liquid, foam or interface. Covers description, principle of operation, application, specifications. Illustrated. Instruments, Inc.

Switches & Keys 482R
Connect into low voltage circuits thermocouples, detectors, batteries, etc. Dimensions, mounting directions, drawings, photos, etc. Catalog E, Section EU. Leeds & Northrup.

Switches, Mercury 482S
Mercury switches designed for use in locations where ordinary glass tube mercury switches are subject to damage. Electrical ratings & specifications. Data Sheet 90. Micro Div.

Switches, Plunger, Precision 482T
Roller plunger switches for heavy-duty actuation by cams having approach angle as great as 30°. Electrical ratings & characteristics. Illustrated Data Sheet 66. Micro Div.

Switches Subminiature 482U
Designed for use where installation space & weight are important factors. Includes characteristics, electrical ratings, prices. Diagrams & photos. Data Sheet 71. Micro Div.

Switches, Time 482V
Specifications, operating data, applications, pricing information, etc. for line of time switches, process timers & time meters. 24 p. Bulletin GEA-5965. General Electric.

Switches, Toggle 482W
Describes 4 designs—2 pole-3 hole mounting; 4 pole-double-throw; 3 pole-double-throw; 2 pole-panel mounting. Illustrated Data Sheets P72, P81, P82, P83. Micro Division.

Tank Car Classifications 482X
Classes of tank cars authorized for shipping ICC regulatory—also certain non-regulatory commodities. Includes typical dome arrangement drawings. 32 p. American Car & Foundry.

Tanks Gas Storage B433
Experienced in the design and fabrication of metal tanks. Builds the kind of high-pressure tanks or vessels required—any size, shape, metal. Catalog offered. R. D. Cole Mfg. Co.

Tape, Plastic 482Y
When written upon, self-sticking tape produces sealed-in-plastic message that resists dirt, oil, water, acids. Available in 3 convenient forms. Illustrated Form 11. Labelon Tape Co.

Teflon Products 409
Data on Teflon parts & products in illustrated 12 p. catalog. Includes bellows, bellows connectors, pump and valve packings, tubing and other molded forms. Crane Packing Co.

Testing Instruments 482Z
Information on non-destructive metal-testing instruments & tramp metal detectors. Also electronic micrometers, leak detectors, pipe finders, etc. Bulletin 32. J. W. Dice Co.

Testing Machines 482AA
Describes testing machines of 50,000 lb. capacity . . . novel weighing system, construction, automatic operation, uses, etc. Illustrated. Bulletin 4206. Baldwin-Lima-Hamilton Corp.

Textiles & Plastics 482BB
Illustrated 42 p. outlines company's history, organization, policies & benefits. Operates in the 3 basic fields of textiles, chemicals & plastics. Celanese Corp. of America.

Thermometers, Electronic Resistance 367
Resistance thermometer operation over complete range from -300 F to 1200 F made possible by development of a low-cost platinum resistance element. Bulletin 230-C. Bailey Meter Co.

Thermometers, Remote Reading 280C
Mercury dial thermometers feature ruggedness, accuracy, sensitivity plus small dial diameter & short bulb length. Suitable where panel and mounting space is limited. U. S. Gauge Div.

Titanium 28
Shows resistance to chloride solutions and retains useful strength up to 800-1000 F. Other advantages and data on application and fabrication of titanium alloys. Rem-Cru Titanium.

Torqometers 423
For the many operations where bolt tension is specified. Indicate required torque with high accuracy. Capacity from 0 to 30 inch-pounds up to 2,000 foot-pounds. Snap-On Tools Corp.

Tractors 482CC
Describes new oil type clutch & 45 other operating details. Feature balanced design & easy steering. Cutaway illustration & specification sheet in Form 30937. Caterpillar Tractor.

Tractors 482DD
Photos & model cutaways of basic components in 32 p. What goes into making up each component. Includes specification sheet & attachment list in Form 30379. Caterpillar Tractor.

Transmission Instruments, Pneumatic 482EE
New pneumatic transmitters, suitable for outtroilling pressure, temperature, vacuum, flow, differential pressure, and liquid level. Describes advantages and features. Bristol Co.

Transmissions, Variable Speed 482FF
Advantages of ¼ to 5 hp transmissions. Compact, easily installed & inexpensive & give infinitely variable speed over a wide ratio. Bulletin 727. Lovejoy Flexible Coupling.

Transmitters, Temperature, Indicating 482GG
New pneumatic transmitters, suitable for outdoor unprotected installation, combine transmitting & indicating functions in one compact assembly. Catalog 1022. Penn Industrial.

Triethanolamine 7
44 p. features latest information on physical properties, specifications, uses and shipping data for triethanolamine and the other amines available. Carbide & Carbon Chem. Co. Div.

Trucks Electric 482HH
Offer new platform lift with push button control. Simplifies & speeds up lighting fixture maintenance & other overhead work. Description & specifications. Barrett-Cravens.

Trucks, Fork 483A	Applications, specifications, operating & construction features, etc. 6000-lb. model with front wheel drive & rear wheel steer. Photos & drawings. Elwell-Parker Electric Co.
Trucks, Lift 483B	Advantages of high lift platform trucks. Elevated platform heights up to 123 inches. Capacities of 3000 & 4000 lbs. Specifications & dimensions. Bulletin P1512B. Yale & Towne.
Tubes & Plates 57	Information on tubes and plates for condensers and heat exchangers. Company offers extensive line of Anaconda Alloys for tube and tube sheets. Publication B-2. American Brass Co.
Tubes & Tubing 483C	Covers product line, range of sizes, lengths, tempers & complete scope of facilities. Features individual product literature available & office & plant locations. Wolverine Tube.
Tubes, Venturi 483D	Primary devices used to produce pressure differentials from flowing liquids for purpose of actuating rate of flow meters. Built with elliptical throat design. Simplex Valve.
Turbines 68a	Range in size from 10 to 1200 hp and include single & multistage axial flow designs as well as the solid-wheel turbine. Illustrated Bulletins S-116, S-146. Terry Steam Turbine.
Turbines, Gas 84-5	Feature improved heat balance, elimination of separate boiler facilities, steam supply of up to 120,000 pounds per hour, etc. Technical Article GER-754. General Electric Co.
Turbines, Mechanical Drive 244-5	Turbines offer cost saving features: combined trip-throttle valve; interchangeable parts; single reservoir for cooling lube oil; etc. Bulletin GEA-4955A. General Electric Co.
Turbines, Single Stage 483E	Design features, dimensions, performance data, etc. HP to 100, pressures to 300 PSIG, temp. to 550F, speed to 4000 RPM. Cutaway diagram. Bulletin 4206. De Laval Steam Turbine.
Vacuum Forming 483F	Automatic cycle vacuum forming machines for sheet plastics. Features, operation, specifications. Vacuum forming process—its advantages & applications. Vacuum Forming.

Valves 483G	Socket & butt welding end dimensions approved by the American Welding Society. Four diagrams indicate standard preparation of valve butt welding ends. Bulletin 507. Edward Valves.
Valves 483H	Details & specifications for gate valve line blinds, by-pass check valves, horizontal check valves, quick-closing valves for fire protection. Installations. Greenwood Valve.
Valves, Check 483I	Feature low pressure drop, no leakage, high system pressure, small size, etc. for 3,000 psi systems. In all metals & in sizes ¼" to 1". Bulletin 1053. Republic Mfg. Co.
Valves, Control 330	New type of pneumatic operator with ability to sense & position, & with power to operate under sudden load changes. Features accuracy & stability. Catalog LB-1. Conoflow Corp.
Valves & Controls 483J	66 p. with illustrations and engineering data describe line of small valves, pressure regulators, stainless steel cylinders, flo-gages, oxy-gas torches, etc. Catalog 2. Hoke, Inc.
Valves, Cylindrical Plug 483K	Feature quick quarter-turn shut-off for safe control, full pipe area for capacity flow, a non-wedging effect for trouble-free performance. Catalog 4CM. American Car & Foundry.
Valves, Diaphragm 415	Lever operated valves with quick opening-quick closing characteristics. Lever action smooth & positive. Suitable for temperatures to 400° F, pressures to 150 psi. Hills-McCanna.
Valves, Diaphragm Control 483L	Drawn steel diaphragm casing withstands heat, impact, pressure, shock. Describes advantages of cast steel open yoke. Automatic control valve data. Bulletin CV53. Kieley & Mueller.
Valves, Gas 483M	Data on construction, specifications, applications for bronze globe, angle, check, spring-loaded check and gate valves. Feature tight seal and positive closure. Fairbanks Co.
Valves, Gate 483N	Corrosion-resistant for all types of acids and alkalies. Unobstructed passages, together with free flow of liquid, easy operation, positive closure, etc. featured. Neumann & Welchmann.

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2	42	61b	89	123f	147a	262-3c	281	296-7a	337-8b	363	402b	425	T442	476W	478H	479P	480S	481W	482FF
6	43	62-3	90a	125	147b	262-3d	282A	296-7b	337-8c	364	402c	L426	B442a	476X	478I	479Q	480T	481X	482GG
7	44	64	90b	127	209	262-3e	282B	304	337-8d	365	403	M426	B442b	476Y	478J	479R	480U	482A	482HH
8	46-7	65	90c	129	211	262-3f	282C	305a	337-8e	366a	404	427	T444	476Z	478K	479S	480V	482B	483A
9	48	66	90d	131a	213a	262-3g	282D	305b	337-8f	366b	405	428a	B444	477A	478L	479T	480W	482C	483B
10	49	68a	91	131b	213b	262-3h	282E	305c	337-8g	367	406	428b	T446	477B	478M	479U	480X	482D	483C
11	50	68b	92	131c	217a	262-3i	282F	305d	339	368a	407a	428c	B446	477C	478N	479V	480Y	482E	483D
12	51	68c	93a	131d	217b	267	283	307	340	368b	407b	428d	451a	477D	478O	479W	480Z	482F	483E
13	52	69	93b	131e	221	271	284A	308	341	369	407c	428e	451b	477E	478P	479X	480AA	482G	483F
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19	55b	71	98b	137	232-3a	275d	287b	313a	344	378	408	431	476A	477I	478T	479BB	481B	482K	483J
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24-5a	56a	73	100	138B	235	275f	287d	314	346	381	410	T433	476C	477K	478V	479DD	481D	482M	483L
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24-5c	56c	75a	102	138D	239	276	287f	316	348	383	412a	T434	476E	477M	478X	480B	481F	482O	483N
24-5d	56d	75b	103	139	241	277a	287g	317	349	384	412b	B434	476F	477N	478Y	480C	481G	482P	484A
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26-7	57	75d	104b	140B	247	277c	288B	319	351	386	414	B435	476H	477P	479B	480E	481I	482R	484C
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35-8b	58c	75g	108-9b	141	251	277f	288E	323	353b	391	417	T437	476K	4778	479E	480H	481L	482U	484F
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35-8e	59	78	113	142C	255a	277i	290A	326	355b	396a	419	B438	476N	477V	479H	480K	481O	482X	484I
35-8f	60a	79	117	142D	255b	278A	291a	327	356	396b	420	T439	476O	478A	479I	480L	481P	482Y	484J
35-8g	60b	80-1	119	142E	255c	279	291b	329	357a	396c	421	B439	476Q	478B	479J	480M	481Q	482Z	484K
35-8h	60c	82	121	142F	257	280A	292A	332	357b	397	422	T440	476R	478C	479K	480N	481R	482AA	484L
39a	60d	83	123a	142G	259a	280B	292B	333	358	398	423	B440	476S	478D	479L	480O	481S	482BB	484M
39b	60e	84-5	123b	142H	259b	280C	292C	334	359	399	424a	L441	476T	478E	479M	480P	481T	482CC	487
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40	60g	87	123d	145	262-3a	280E	292E	336	361	401	424c	R441b	476V	478G	479O	480R	481V	482EE	
41	61a	88	123e	146	262-3b	280F	293	337-8a	362	402a									

. . . And these items in the Reader Service "Flashback" Section (p. 485)

218A	220E	222E	224D	224I	226E	231A	232A	232F	236A	236F	238E	241B	242D	245A	332A	334A	336A	342A	343A
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220B	222B	224A	224F	226B	228B	231C	232C	234B	236C	238B	240A	242B	244A	246A	333B	334C	338B	342C	343C
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220D	222D	224C	224H	226D	230B	231E	232E	235B	236E	238D	241A								

. . . Send me these reprints, I will remit on receipt. (See last Reader Service page for description.)

1 2 3 4 6 11 14 15 17 21 22 22a 22b 25 26 28 29 30 33 34 35 36 37 38 39 40

Valves, Gate, Flat Plate 484A	Immune to dust-laden gases & impure liquids containing crystals, granular particles, silt, sludge, slime, etc. Includes advantages & valve cross section. Neumann & Weichmann.
Valves, Needle 484B	Construction details, dimensions & capacity tables. Includes packless type, characterized needle, high temperature, etc. Illustrated Catalog Section A. Associated Valve & Engrg.
Valves, Plug 249b	Easily operated, non-lubricated, maintenance-free plug valves. Valve is built of corrosion-resisting alloys with a Teflon sleeve. Complete details in Bulletin V/4. Duriron Co.
Valves, Plug 386	The plug adjusting nut, an exclusive feature, permits the plug to be lifted slightly from its seat, making it easy to open or close the valve. Catalog offered. Oil Tool Co.
Valves, Porcelain 66	Bulletin describes characteristics of chemical porcelain. Data on safety valves, plug cocks, flush valves, pipe fittings, towers, raschig rings & other equipment. Lapp Insulator Co.
Valves, Safety 484C	Describes line of pop safety & relief valves for steam, air, gas, water, oil, etc. Covers operation, installation, leading dimensions. Illustrated Circular 502. Lunkenheimer Co.
Valves, Safety & Relief 484D	Use, service range, sizes available, body materials, etc. for corrosion-resisting valves. Includes dimensions & capacity tables. Catalog Section E. Associated Valve & Engrg.
Valves, Solenoid Operated 484E	Operating instructions, detailed parts lists, dimensions, specifications. Automatically open or close in response to time clock, pressure switch, etc. Bulletin W-7. Golden-Anderson.
Valves, Spray 484F	For lubricating open gearing & slide surfaces. Spread & maintain uniform thin film of oil or grease over bearing areas. Eliminate friction, reduce wear, etc. Bulletin 60. Farval.
Valves, Temperature Control 280D	Advantages of accurate control & desired sensitivity remain though number of wearing parts are reduced. Covers parts, patented sliding gate design, dimensions. Jordan Regulator.
Vibrating Equipment 60a	Literature on feeders, dryers, packers, conveyors, coolers, screens. Types and sizes to meet requirements in continuous processing—at low over-all cost. Jeffrey-Traylor Div.
Vibrators 484G	Electric motor driven rotary external vibrator with new mounting clamp. Rugged, effective & simple to use. Operation, installation, applications, specifications, etc. Viber Co.
Vinyltoluene 484H	47 p. booklet, illustrated with many charts & graphs, is organized in three sections representing the fields of use of vinyltoluene in the paint vehicle industry. Dow Chemical Co.
Viscometers 484I	Sturdily built, precision instruments for recording or recording-controlling of viscosity in industrial plants. Covers design, operation, advantages, etc. Norcross Corp.
Watches, Stop 484J	For industrial medical, radio & research purposes. Precision time & motion study features. Coil-spring mechanism ends possibilities of wear, friction & failure. M. Ducommun Co.
Watches, Stop 484K	Stop watches & chronographs for time study in industry. Features non-breakable coil spring mechanism for highest accuracy under rugged industrial applications. Herman H. Sticht.
Welders, Arc, Engine-Driven 24-5a	Feature more capacity than other welders with same rating: 20-gallon gas tank; latest-type welding generator, powered by direct-connected gasoline engine, etc. Harnischfeger Corp.
Welding 484L	Describes company's history, products, manufacturing equipment & procedures, research projects, etc. Process of non-fusion welding explained. 16 p. Eutectic Welding Alloys.
Wheels, Cut-Off 484M	36 p. with data on cutting-off machines & abrasive cut-off wheels—selection, application & usage. Photos of typical cutting-off operations & tables for wheel selection. Norton.
Wire Cloth 416	Describes advantages for industrial wire cloth. Provides full range of mesh sizes and types of cloth available. Also includes valuable metallurgical data. Cambridge Wire Cloth Co.

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Flashback . . .

To make sure that you don't miss any news that could help you with your job, Chemical Engineering is doing a double take for you. The listings on this page are a repeat of the editorial listings only on chemicals, equipment and services featured last month in the New Equipment and New Products departments. Use the postcard below for more information on any item in this list.

CHEMICALS

Alcohols, mixed primary amyl....332A
Alkyl phenols concentrate....343C
Antibiotics....333C
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Cleaner-inhibitors....343B
Coatings, pigmented metallic....333A
Corrosion inhibitors for quarternary ammonium cpds....334B
Desiccants....338B
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Fire extinguishers....343D
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Molybdenum disilicide....343A
Penicillin, stable liquid suspension....333C
Polymethoxy acetals....342B
Rayon, high tenacity....336A
Resins, Alkyd coating....338A
  Foamed silicone....333B
Sodium polyphosphate....334C
Tridecyl alcohol....269C
Vinyl base cement....342D

EQUIPMENT

Air conditioning units....244A
Air transport....222F
Alloys, Hard surfacing....224F
  Radiation shielding....224G
Bender, conduit....232F
Boilers, packaged....246A
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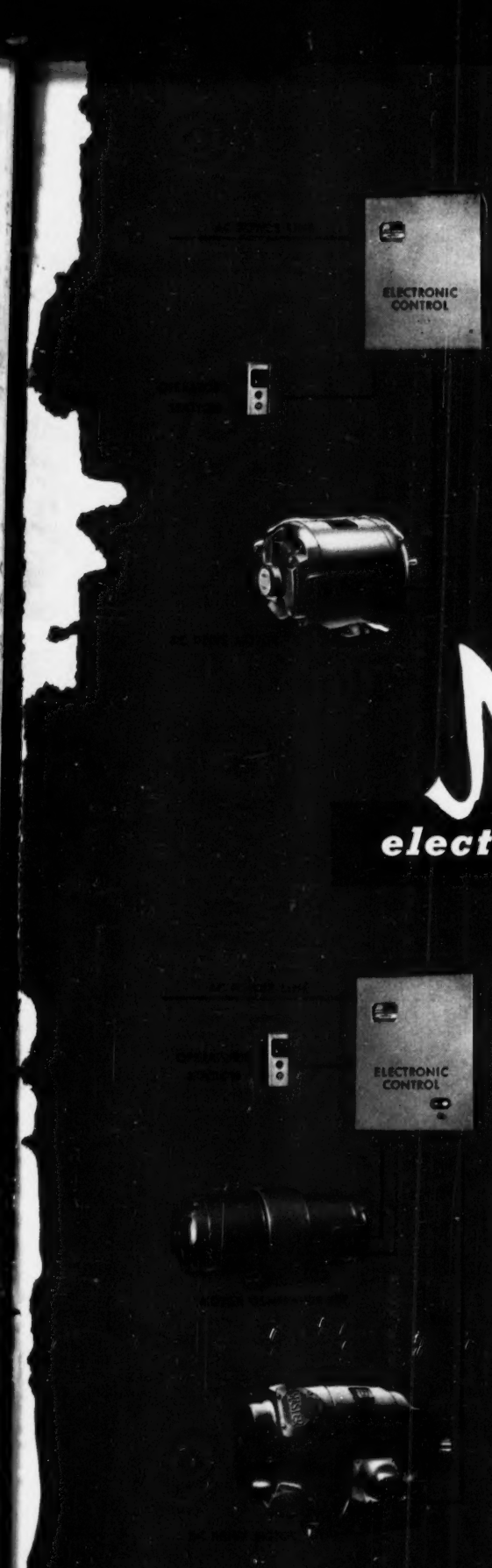

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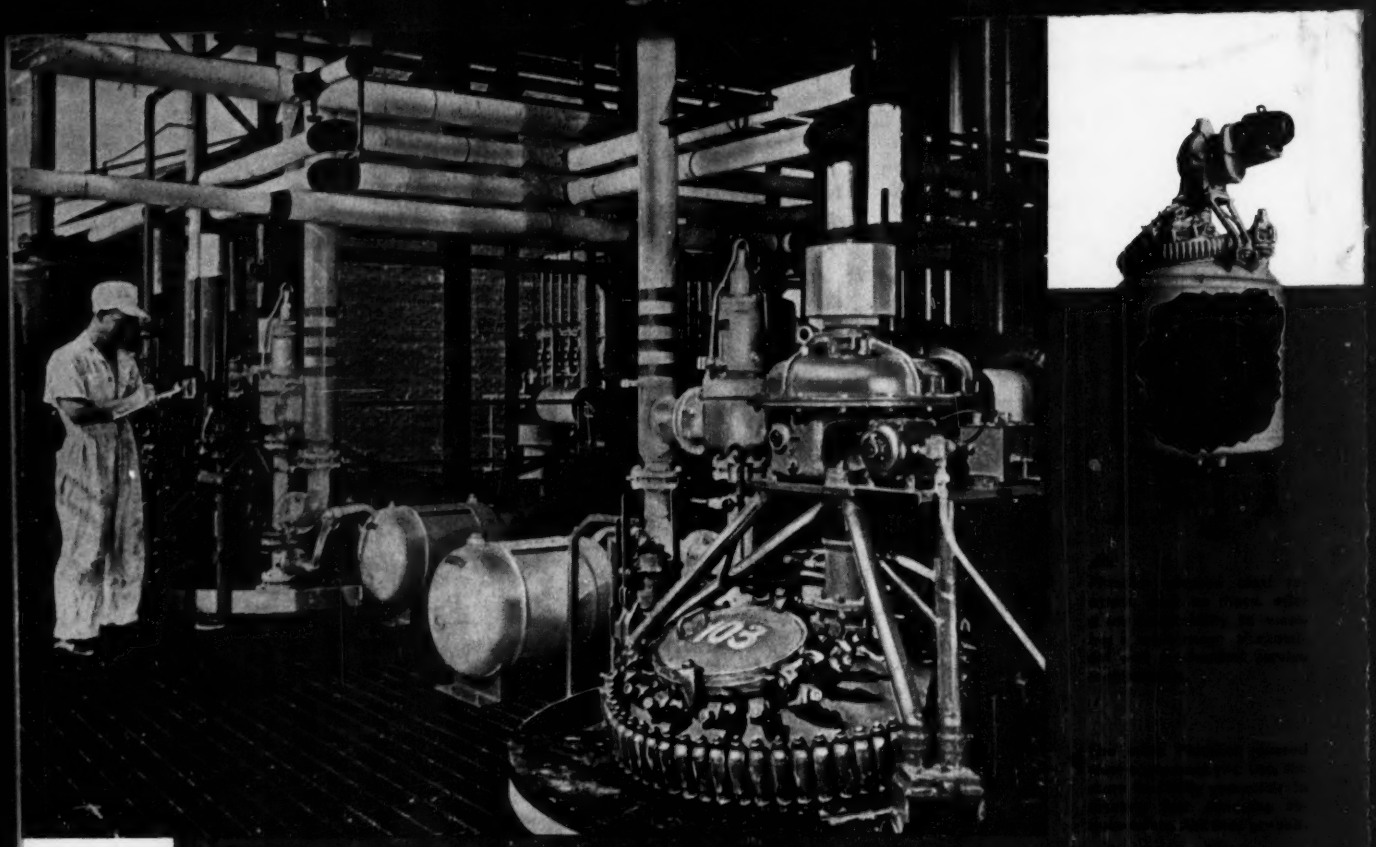

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